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ABSTRACT

Abstracts of papers accepted for presentation in the Research Consortium sessions of the 1988 American Alliance for Health, Physical Education, Recreation and Dance Convention in Kansas City, Missouri, are published in this volume. Abstracts of presentations made in the symposia are presented first, followed by those in the free communication sessions, and finally those in the poster sessions. The presider for each session is listed in the table of contents. The date and time of presentation are listed in the lower left hand corner of each abstract. (Author/JD)

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ABSTRACTS

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Research Papers
1988
AAHPERD Convention

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ABSTRACTS

of Research Papers 1988

Diane L. Gill, Editor
University of North Carolina, Greensboro

Jane E. Clark, Symposium Abstracts Editor
University of Maryland

Presented at the Kansas City, Missouri Convention of
American Alliance for Health,
Physical Education, Recreation and Dance
in the Research Consortium Meetings

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American Alliance for
Health, Physical Education,
Recreation, and Dance
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Purposes of the American Alliance For Health, Physical Education, Recreation and Dance

The American Alliance is an educational organization, structured for the purposes of supporting, encouraging, and providing assistance to member groups and their personnel throughout the nation as they seek to initiate, develop, and conduct programs in health, leisure, and movement-related activities for the enrichment of human life.

Alliance objectives include:

1. Professional growth and development – to support, encourage, and provide guidance in the development and conduct of programs in health, leisure, and movement-related activities which are based on the needs, interests, and inherent capacities of the individual in today's society.
2. Communication – to facilitate public and professional understanding and appreciation of the importance and value of health, leisure, and movement-related activities as they contribute toward human well-being.
3. Research – to encourage and facilitate research which will enrich the depth and scope of health, leisure, and movement-related activities; and to disseminate the findings to the profession and other interested and concerned publics.
4. Standards and guidelines – to further the continuous development and evaluation of standards within the profession for personnel and programs in health, leisure, and movement-related activities.
5. Public affairs – to coordinate and administer a planned program of professional, public, and governmental relations that will improve education in areas of health, leisure, and movement-related activities.
6. To conduct such other activities as shall be approved by the Board of Governors and the Alliance Assembly, provided that the Alliance shall not engage in any activity which would be inconsistent with the status of an educational and charitable organization as defined in Section 501(c) (3) of the Internal Revenue Code of 1954 or any successor provision thereto, and none of the said purposes shall at any time be deemed or construed to be purposes other than the public benefit purposes and objectives consistent with such educational and charitable status.

Bylaws, Article III

PREFACE

Abstracts of papers accepted for presentation in the Research Consortium sessions of the 1988 AAHPERD Convention in Kansas City are published in this volume. A total of 366 abstracts were submitted for review. Each abstract was evaluated by three reviewers, who were recommended by the various associations, ARAPCS councils, and NASPE academies. Over 100 individuals were involved in the review process -- their names and institutional affiliations are listed on the following pages. This volume also contains abstracts of papers presented in symposia which were submitted and accepted following a similar review process coordinated by Dr. Jane Clark of the University of Maryland, Secretary of the Research Consortium. The titles of Invited Research Consortium Scholar Lectures also are listed.

Abstracts of presentations made in the symposia are presented first, followed by those in the free communication sessions, and finally those in the poster sessions. The presider for each session is listed in the table of contents. The date and time of presentation is listed in the lower left hand corner of each abstract.

Thanks are extended to the Research Consortium Executive Committee of Hal Morris, B. Don Franks, and Jane Clark for their numerous helpful suggestions and contributions. Ray Ciszek, Lysa Frisella and numerous others at AAHPERD headquarters are thanked for their assistance throughout the review and publication process. The reviewers and presiders are thanked for their cooperation and assistance. Special thanks go to Wanda Walker, Jera Duff and J. Ted Miller who spent numerous hours in typing, sorting, answering phone inquiries and various other tasks associated with the review, selection, and publication process.

The contributions of many individuals enable the Research Consortium to provide the various associations, councils and academies with forums for the dissemination of research at the annual AAHPERD Convention. This increasingly important component of the convention allows AAHPERD to provide a multidisciplinary program of research that serves the respective disciplines in the highest manner.

Diane L. Gill
President-Elect, Research Consortium
Department of Physical Education
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Greensboro, NC 27412

REVIEWERS

The following individuals served as reviewers for the abstracts submitted for the 1988 AAHPERD Convention:

Stephen Anderson	Indiana University
Dean Anderson	Iowa State University
Rosemary Aten	Western Illinois University
Linda Bain	University of Houston
Kate Barrett	University of North Carolina at Greensboro
Barry Bates	University of Oregon
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Craig A. Wrisberg	University of Tennessee
Michael Young	University of Arkansas
Carole Zebas	University of Kansas
Earle Zeigler	University of Western Ontario
Howard N. Zelaznik	Purdue University

The following individuals served as reviewers for the symposia:

Judith Gray	Foster City, California
Marilyn Long	Northern Illinois University
Jean Williams	University of Arizona
Michael Young	University of Arkansas, Fayetteville

Thursday, April 7, 10:45 a.m.-Noon
RESEARCH CONSORTIUM SCHOLAR LECTURE
PRESIDER: Barry T. Bates, University of Oregon, Eugene
SPEAKER: James G. Hay, University of Iowa, Iowa City
TOPIC: "Service, Research and the Elite Athlete"

Friday, April 8, 9:00-10:15 a.m.
AAHPERD Alliance Scholar
SPEAKER: Waneen Wyrick Spirduso, University of Texas, Austin
TOPIC: "Exercise, Aging and Mental Function"

Friday, April 8, 10:30 a.m.-Noon
RESEARCH CONSORTIUM BUSINESS MEETING

Friday, April 8, 2:00-3:15 p.m.
RESEARCH CONSORTIUM SCHOLAR LECTURE
PRESIDER: Edward McAuley, University of Oregon, Eugene
SPEAKER: Daniel M. Landers, Arizona State University, Tempe
TOPIC: "Cognitive States of Elite Performers: Psychological Studies of Attention"

Saturday, April 9, 7:30-8:30 a.m.
RESEARCH CONSORTIUM EARLY BIRD SESSION
SPEAKER: Jerry R. Thomas, Louisiana State University, Baton Rouge
TOPIC: "Why Some Publish and Some Perish"

Saturday, April 9, 9:00-10:15 a.m.
RESEARCH CONSORTIUM SCHOLAR LECTURE
PRESIDER: Lynn D. Housner, New Mexico State University, Las Cruces
SPEAKER: Daryl Siedentop, Ohio State University, Columbus
TOPIC: "Current Directions in Sport Pedagogy Research at the Ohio State University"

Saturday, April 9, 2:00-3:15 p.m.
RESEARCH CONSORTIUM SCHOLAR LECTURE
PRESIDER: Susan Greendorfer, University of Illinois, Urbana
SPEAKER: Janet C. Harris, University of North Carolina at Greensboro
TOPIC: "Contextualizing the Contests: Using Interpretive Sociocultural Research Methods to Study Sports"

Sunday, April 10, 7:30-9:00 a.m.
C. H. McCloy Lecture Breakfast
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OUTDOOR EDUCATION: LEADERSHIP DEVELOPMENT AND EFFECTS OF ADVENTURE PROGRAM PARTICIPATION. Sponsored by the Council on Outdoor Education. J. Thomas Chesnutt, The University of Alabama.

The purpose of this symposium is to present and discuss current research related to the development of leaders for outdoor education programs and the effects of adventure programs upon participants. Particular attention will be given to the influence of adventure programs upon group cohesion, teamwork and changes in expectations and motivations as related to experience. Thousands of adolescents and adults annually participate in outdoor education and adventure programs sponsored by schools, colleges, universities, resident camps, and environmental interpretative centers. To serve this public responsibly with regard to safety and learning outcomes, the leaders must be properly trained. Since the benefits of such programs are widely extolled, the specific impact upon the participants should be examined. The symposium is targeted to an audience composed of educators, school administrators, outdoor specialists, and recreation professionals involved with outdoor education programs.

THE OUTDOOR ADVENTURE PARTICIPANT: MODELING THE CHANGE. Alan Ewert, Pacific Crest Outward Bound School.

The purpose of this study was to develop a predictive model of the outdoor adventure participant. Using Bryant's (1979) Theory of Specialization as the theoretical foundation, this study investigated the change in levels of the following variables as experience of the participant increased: type of risk sought in the adventure experience; locus of control; motivations for participation; social orientation; and skill level. One hundred and fifty outdoor adventure participants were queried using a ten item questionnaire. Using discriminate analysis and regression techniques, significant differences were generated in the above variables using experience level as the independent variable. For example, those individuals with more experience reported more intrinsic reasons for participation than did individuals with little or no prior experience in the activity. The results of this study have implications beyond an academic focus. Both practitioners and outdoor educators strive to provide programs that are congruent with the needs of the participants. It is believed that the data resultant from this study will assist them in that effort.

Dr. J. Thomas Chesnutt
Area of HPER
The University of Alabama
Tuscaloosa, AL 35487-1967

Thursday, April 7
9:00-10:15 a.m.

THE EFFECTS OF A TWO-WEEK ADVENTURE PROGRAM ON GROUP COHESION IN THE PHYSICALLY HANDICAPPED. Frank B. Ashley, Texas A & M University.

Twenty-eight physically handicapped campers attending a two-week session were selected as subjects to determine the effects of an adventure program on group cohesion. Subjects were matched and paired according to sex, age, and disability, and randomly assigned to an adventure group or a control group. Individuals in the adventure group participated in a camp program consisting of adventure activities while the control group went through two weeks of the regular camp program. To measure group cohesion, the Fundamental Interpersonal Relations Orientation Behavior test was administered to all subjects. MANOVA demonstrated no significant differences in group cohesion between the two groups. There were also no significant changes in group cohesion for either group from pretest to posttest. Within the limitations of the study it was concluded that a two-week adventure program for the physically handicapped did not have a greater effect on group cohesion than a two-week traditional camp program.

THE EFFECT OF A PROJECT ADVENTURE TEAMWORK WORKSHOP ON THREE BASKETBALL TEAMS. Brenda Kay Zopfi Segall, Etowah High School.

The purpose of this study was to determine the effect a teamwork workshop, using Project Adventure as a base, would have on the teamwork of a basketball team. The subjects consisted of 25 female high school basketball players. Prior to basketball season the three basketball teams participated in a 3-day teamwork workshop based on Project Adventure. The teams were videotaped during ten minute intrateam scrimmages before and after the workshop. The participants responded to open-ended evaluations of the workshop immediately following the workshop, and at the end of the basketball season. The coaches rated their players' skills and overall teamwork using the videotapes. A Friedman test was applied to the coaches' ratings of individual skills. Junior Varsity and Freshman teams demonstrated significantly greater skill following the workshop. All coaches rated the overall teamwork higher following the workshop and stated that the workshop had a positive effect on their teams. All participating players stated that the workshop improved their season.

Dr. J. Thomas Chesnutt
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Tuscaloosa, AL 35487-1967

THE IDENTIFICATION OF DESIRABLE KNOWLEDGE AND SKILLS IN OUTDOOR LEADERS OF OUTDOOR PURSUITS, RESIDENT CAMPING, AND OUTDOOR EDUCATION AND ENVIRONMENTAL INTERPRETATION PROGRAMS IN THE UNITED STATES. Bill Johnson, University of Wisconsin-LaCrosse.

The purposes of this study were to identify the knowledge and skills perceived desirable in leaders of outdoor education programs and to ascertain the differences and similarities between programs and investigate the possibility of universal knowledge and skills. A preliminary task was to develop a comprehensive list of knowledge and skills. The final instrument containing 120 statements determined by the author, was juried and pilot-tested. The instrument was distributed to 600 experienced outdoor educators. Each knowledge and skill was rated by the respondents on a five point Likert-type scale. As a result of the initial mailing and follow-up procedures, 219 (36.5 percent) of the surveys were returned. The statistical mean for each knowledge and skill was used to determine the rank order of essentiality for each program and for the total group. Factor analysis identified three factors which accounted for 42.5 percent of the total variance. The factors were descriptively termed "Technical," "Environmental ," and "Management." As a result of this study a paradigm and list of essential and important knowledge and skills were developed for each program and the universal knowledge and skills identified.

Dr. J. Thomas Chesnutt
Area of HPER
The University of Alabama
Tuscaloosa, AL 35487-1967

CONTROVERSIAL ISSUES RELATING TO ACTIVITY AND THE LOW BACK

The purpose of this symposium is to synthesize research in areas in which controversy exists relative to exercises and activities typically recommended to ameliorate low-back functioning. The areas that will be addressed include (a) the importance of abdominal muscle strength (including specific suggestions on its development and measurement), (b) pelvis and spine carriage (including implications for trunk flexibility) and (c) an examination of the mechanical aspects of lifting. This symposium will include original research as well as a synthesis of the most recent research. Although low-back pain accounts for more lost work-hours than any other type of occupational injury, the condition is often amenable to exercise. The information presented in this symposium will enable physical education teachers, as well as other exercise leaders, to have a better understanding of exercises and activities which have low-back implications.

ABDOMINAL MUSCLE STRENGTH. Loarn D. Robertson, Portland State University.

The purpose of this paper is to analyze the good and the bad points of the exercises typically prescribed for the development of abdominal muscle strength. Since strong abdominal musculature has long been recognized as being critical to the enhancement of low back function, activities for improving strength in this area are typically included in all exercise protocols. However, the exercises prescribed in clinical settings are markedly different from those used in schools; one of the reasons is that an exercise typically stressed in the schools has clinical contraindications. In addition to summarizing the clinical research in this area and elucidating these contraindications, a recently developed modified curl-up test (CUT) will be presented. The CUT elicits greater abdominal muscle activity and less hip flexor activity than is seen in the more typically used testing protocols; furthermore, a facsimile of the CUT is used extensively in clinical low back exercise programs.

Wendell Liemohn
1914 Andy Hole Avenue
University of Tennessee
Knoxville, TN 37996-2700

Thursday, April 7
2:00-3:15 p.m.

PELVIS AND SPINE CARRIAGE. Wendell Liemohn, University of Tennessee.

The purpose of this paper is to present ramifications of posture on low back function. Since tightness in the musculature of the lower back and hip joint can affect the positioning of the pelvis with a concomitant effect on the posture of the spinal column, flexibility is a factor addressed in low back treatment regimens. Besides presenting the advantages and disadvantages of different flexibility testing and exercise protocols, the advantages of using new unilateral (as opposed to bilateral) flexibility exercise and testing protocols will be delineated. This paper will also address postural divergencies in jogging which may or may not be related to flexibility but which can exacerbate low-back functioning. The nuances of jogging postures discussion will include an explanation of why jogging with an upright posture (as opposed to a forward leaning one) can diminish intradisc pressures and make jogging a palatable exercise for even individuals with low-back pain.

A RE-EXAMINATION OF LIFTING POSTURES. Gina L. Sharpe, University of Tennessee.

The purpose of this paper is to present research on lifting technique as a skill to minimize the risks of lift-related low-back injuries. Because "improper" lifting has been indicted as being a potential causal factor in low-back pain and injury, many exercise leaders include in their health/fitness programs demonstrations of the "proper" way to lift an object. Confounding the issue of which posture is safest for lifting is the realization that lifting postures are dependent upon several factors, such as the (a) lifter's strength and mobility and (b) size and shape of the object lifted. Contrary to popular notion, there is little definitive evidence that any one particular posture is advantageous for all lifting tasks. This paper will provide a synthesis of the available biomechanical research as well as providing suggestions for teaching lifting.

Wendell Liemohn
1914 Andy Holt Avenue
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WOMEN IN SPORT POST TITLE IX: THE GOOD, THE BAD AND THE PESSIMISTICALLY OPTIMISTIC

The passage of Title IX brought about a wave of optimism regarding female participation in sport. Fifteen years later, the impact of Title IX is still being debated in both the popular press and research literature. Current perspectives about the social acceptability of women's athletics range from a belief that female athletes have gained widespread support and acceptance, to a prognosis of failure and retrenchment. The purpose of this symposium is to provide empirical data to address the following questions: 1) Where are we now?; 2) What specific changes have taken place?; 3) How fundamental have these changes really been? These questions will be considered with respect to the total sport experience for females. Three separate but interrelated dimensions of women's sport will therefore be presented. The first dimension involves women's sport experience within intercollegiate athletics. The second dimension relates to mass media coverage given to female athletes before, during and after Title IX. The final dimension examines women's sport experience beyond participation by exploring career options for females within the sport management field. The implications of these findings for both academics and practitioners will be discussed.

Mary Jo Kane
School of HPER
Bowling Green State University
Bowling Green, OH 43403

Friday, April 8
3:45-5:30 p.m.

MEDIA COVERAGE GIVEN TO FEMALE ATHLETES BEFORE, DURING AND AFTER TITLE IX: A CONTENT ANALYSIS OF SPORTS ILLUSTRATED. Mary Jo Kane, Bowling Green State University.

This study examined the impact of Title IX on media coverage given to female athletes. This was done to determine if there has been a shift away from negative social stereotypes traditionally associated with women's sport participation. Metheny (1967) argued that sports are either socially acceptable (e.g., golf) or unacceptable (e.g., rugby) for females. A content analysis of articles in Sports Illustrated between 1964 and 1987 was conducted. A key question was whether there was a change over time in both the amount and type of coverage given to women. Chi-square analyses revealed "mixed" results. After Title IX, there was a significant increase in the amount of coverage given to female athletes. However, significantly more attention was consistently given to females in socially acceptable versus unacceptable sports, regardless of a Title IX timeframe. These findings challenge beliefs that all female athletes have gained widespread social acceptance.

SALARIES IN SPORT MANAGEMENT CAREERS: DOES GENDER MATTER? Janet B. Parks, Bowling Green State University

This study examined salaries of sport management practitioners as related to gender. The data were derived from a 1987 sport management alumnae/i survey. Careers were divided into three categories: 1) Sport Sciences Management; 2) Sport Information Management; and 3) Sport Organization Management. Salaries were classified as "low", "medium", or "high". Overall, 67% of the practitioners in the "low" salary classification were women; only 25% of the practitioners in the "high" salary classification were women. Within each career category, gender differences also emerged. There were more women than men with "low" salaries in each career category; there were more men than women with "high" salaries in two of the three career categories. Results suggest that the dramatic increase in women's sport participation precipitated by Title IX has not been accompanied by increased financial rewards for women in sport management careers.

Mary Jo Kane
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Bowling Green, OH 43403

ALTERNATIVE SPORT STRUCTURES AND THE SPORT EXPERIENCE OF FEMALE INTERCOLLEGIATE ATHLETES. Susan L. Greendorfer, University of Illinois; Elaine M. Blinde, Southern Illinois University.

Given the substantial number of changes in women's programs prompted by Title IX, little is known relative to how these changes have altered the sport experience of female athletes. Since several researchers have noted that structural context, which includes environmental setting and program philosophy, has the capability of influencing orientations and behavior, the purpose of this study was to compare and contrast the sporting experiences of female athletes who participated in an educational sport model with those who participated in a professionalized sport model. A twelve-page fixed-alternative questionnaire with some open-ended items was administered to 301 female athletes in Division I and 271 athletes from Division III. Survey items tapped the athletes' perceptions of and reactions to their intercollegiate sport experience, particularly with respect to values emphasized in their program, demands or sacrifices made, role conflict between academic and athletic expectations and quality of intercollegiate sport experience. Results from various t-tests and Chi-square analyses revealed significant differences between both groups with respect to motivation, values emphasized and sacrifices made. Specifically Division III athletes were more likely to participate in order to be with others interested in sport, for sheer enjoyment of the activity, and for intrinsic reasons. In contrast, Division I athletes were more likely to participate for extrinsic rewards and skill comparison. Division III athletes were more likely to characterize their sport program as enjoyable, humanistic, sociable and fun, while Division I athletes used such terms as competitive, impersonal, rule-governed and goal oriented. Reactions also varied, with Division I athletes more likely to suggest exploitation, pressures leading to sacrifices and possible value conflict and alienation. These findings are considered in light of existing program philosophies, organizational emphases and quality of the female intercollegiate athlete's sport experience.

Mary Jo Kane
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Bowling Green State University
Bowling Green, OH 43403

EVALUATING PROGRAMS OF SEXUALITY EDUCATION/PREGNANCY PREVENTION: RESEARCH GUIDELINES AND EXAMPLES

Programs that address sexuality education and/or pregnancy prevention continue to be controversial. Proponents of such programs often argue that education can delay student involvement in sexual activity result in more consistent contraceptive use among those that are participating in sexual intercourse and reduce the number of teen pregnancies. Some critics argue that education actually results in an increase in sexual activity, while others caution against overzealous claims. Evaluation of educational programs is needed to ascertain program effectiveness and to assist local school and community groups in planning for program improvement. This symposium provides both suggestions for conducting program evaluation and specific research examples. Suggestions given should provide practical guidance to the beginning researcher and serve as important reminders to "veterans". Examples focus on (1) Evaluation of a community based program, (2) Factors influencing program effectiveness, and (3) Examination of a national probability group.

AN EVALUATION OF FIVE APPROACHES FOR ORGANIZING EARLY ADOLESCENTS AND PARENTS FOR FAMILY LIFE INSTRUCTION. Michael Hamrick, Memphis State University.

This presentation highlights the results of a community based family life program in which early adolescents (ages 10-14) and their parents were grouped for instruction in five different ways. The results of sex knowledge, attitude, and communication inventories support several conflicting conclusions. Knowledge and attitude scores improved the most when adolescents and parents received instruction in separate groups. In terms of improving family communication, however, the opposite was true. Groups which combined parents and adolescents for instruction talked more often and consistently about sexuality issues. All things considered, the single most effective format was one in which parents and adolescents met first in separate groups, at different times, and then met together.

Michael Young, Ph.D.
Health Education Program
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Fayetteville, Arkansas 72701

Saturday, April 9
10:45-12:00 noon

EVALUATING PROGRAMS OF SEXUALITY EDUCATION AND PREGNANCY PREVENTION. W.L. Yarber, Indiana University.

This presentation describes selected fundamental principles and provides practical suggestions for evaluating programs of sexuality education and pregnancy prevention. Specific attention will be given to problems and solutions for improving experimental and quasi-experimental designs. Suggestions will be given for addressing important problems and components of experimental research with specific application to programs of sexuality education and pregnancy prevention. Problems to be addressed include: Inability to randomize subjects, failure to secure a control group, measuring change and linking change to the treatment effect, testing immediate and long term effects, avoiding control group contamination, measuring important changes and adjusting for dissimilar experimental and control groups. Evaluation of sexuality education and pregnancy prevention programs is needed and can be improved by attention to fundamental concepts and application of alternative strategies to research problesm.

THE PLANNED PARENTHOOD POLL: A SECONDARY ANALYSIS OF NATIONAL DATA. Michael Young, University of Arkansas.

The purpose of the study was to identify correlates of (1) sexual activity, and (2) contraceptive use among a national probability sample of American teenagers. The data reported are from the Planned Parenthood Poll. Data were collected during September and October, 1986 by Lou Harris and Associates, Inc. Their report and a data tape are available to the public. Subjects were 1,000 teenagers age 12-17. Both data presented in the published report, which was presented in a series of tables detailing frequency counts and percentages, and data from the tape were analyzed. Significant correlates of participation in sexual intercourse and contraceptive use were identified. Sex education was not a factor. Significant correlates for contraceptive use at first intercourse included sexual knowledge, comprehensive sex education, and talking to parents about sex and birth control. These results contradict at least some of the claims in the data report and emphasize the need for appropriate data analysis.

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EVALUATION PROTOCOL FOR THE SCHOOL/COMMUNITY PROGRAM FOR SEXUAL RISK REDUCTION AMONG TEENS. Murray Vincent, Ed.D., Professor of Public Health, University of South Carolina, Columbia, SC; Drew Clearie, MSPH, Owner and Operator, Drew Clearie Associates, Washington, DC.

A school and community-based education intervention has been in place in a rural South Carolina community since 1982. The outcome objective of the intervention is to reduce the occurrence of unintended pregnancy among never-married teens and preteens. The intervention messages stress postponement of initial, voluntary intercourse, and also the appropriate use of effective contraception. The intervention evaluation protocol is three-tiered. The first or annual tier assesses the completion of the annual process objectives, the intervention message dissemination activities. The second or cumulative tier compares self-report of sexual activity and contraceptive use between adolescents in a comparison community. The third or long-range tier compares trends in pregnancies between the two adolescent populations. This evaluation protocol derives strictly from the intervention framework and provides continual and immediate feedback in regard to intervention direction and success.

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RETHINKING WOMEN'S SPORT LEADERS--1920s-1930s: NEW VIEWS INSIGHTS AND ANALYSIS

The purpose of this symposium is to examine the social context, coalitions, leadership patterns and conflicting ideologies of leaders dedicated to expanded sporting experiences for girls and women in the 1920s and 1930s. The focus is on Lou Henry Hoover and selected physical educators, and their role and influence on the issue of a male (competitive) model vs. the alternative female (recreational) model of athletics. The collective significance of the studies lies in their analytical approach within a contextual framework, enabling the researchers to gain new insights, dispel myths and apprehend interrelationships not previously understood, especially the conflicts among physical education women. For example, one study reveals that the leaders of competitive athletics in the South were physical education women. The leaders studied demonstrate a pattern of leadership not unique, but instead one that parallels the pattern of women leaders in volunteer organizations, and is consistent with the culture. Together, the conclusions from the symposia will pose a set of questions that requires the use of a new "prism" through which to view women in sport.

THE ROLE AND INFLUENCE OF LOU HENRY HOOVER IN FORMATION OF THE WOMEN'S DIVISION OF THE NATIONAL AMATEUR ATHLETIC FEDERATION.

Joan S. Hult, University of Maryland.

Lou Henry Hoover is the missing link in studies of women sport organizations crusading for a female model of athletics under female leadership. She emphasized health, socialization and mass participation. As Vice-President of the NAAF LH Hoover called together recreation and physical education leaders to form the Women's Division to develop policies for girls' and women's sport programs. It was through this unique coalition of physical education leaders and her own circle of friends, and because of her political and economic clout as a public figure,(as well as her propensity for seeking sound professional counsel) that LH Hoover was able to so effectively disseminate information and influence public policies. Thus, contrary to the physical education literature, she was a primary instigator and continuous leader of the WD for most of its significant years, and not a "figurehead." In fact, it was only a few years before the WD was dissolved that she ceased to function as a leader.

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Saturday, April 9
3:45-5:30 p.m.

NETWORKING IN SPORT: LOU HENRY HOOVER STYLE. Jan Beran, Iowa State University.

Both men and women professional physical educators and physicians were instrumental in forming policies for women's sport in the 1920s. However, government leaders, and workers in social agencies (e.g., YWCA, Girl Scouts) also were active in providing recreational activities for all females. Mrs. Hoover emerged as the most significant leader outside of education through her work in the Women's Division and the Girl Scouts. Because of her personal relationships with government officials, she was able to marshall financial resources to support the WD, and to exercise political clout through other women leaders. She also effectively used networking between professional physical educators, civil servants, social agencies and professional volunteers to forge and promulgate policies. The network strategies of the 1920s may well lend insight for today's leaders in women's sport.

REINTERPRETING THE LEADERSHIP ROLES OF MABEL LEE, ETHEL PERRIN AND AGNES WAYMAN. Steveda Chepko, Castleton State College.

This study analyses the leadership of three physical educators and their role in the WD, emphasizing leadership patterns. Cultural values were clearly manifested in the standards, ideals, principles and policies they helped to develop in the WD Platform. These same values were operant in their organizational coalitions and their respective institutions. All three promoted the democratic concept of "a sport for every girl and every girl in a sport," healthy living through sport and inculcating "appropriate" social values through recreational sport in the schools. Through networking with women leaders such as LH Hoover they influenced the public sector as well. Their leadership patterns paralleled those of women leaders elsewhere in society, in that both used volunteerism to achieve social reforms. In contextual perspective, the leadership of these physical educators is not unique--only the sphere of their activities. As with other women leaders, their approach is consistent with their socialization. Analysis of women's sports needs to consider this broader contextual framework.

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RENEGADES OF THE SOUTH: WOMEN PHYSICAL EDUCATION LEADERS PROMOTE COMPETITION. Jane Hooker, Memphis State University.

This case study focuses on women leaders of varsity athletic programs of the Mississippi Valley Conference and local industrial leagues in Tennessee, both of which subscribed primarily to the male athletic model. The collegiate programs were organized and administered by women physical educators with only a few men coaching, while the industrial leagues were administered by men with many women coaches. Both encouraged spectators and were generally supported by the community. Nothing in the data indicates that these leaders perceived their activities to be in conflict with their culture. Further, they apparently were not influenced by the WD. This suggests that these seemingly anomalous programs were actually congruent with the culture. The literature has not recognized women's competitive athletics in the 1920s and 30s; however, this case study demonstrates that they did persist even after the WD's efforts to control women's sports. It remains for further research to uncover similar programs and their significance.

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THE DANCE PERFORMANCE AESTHETIC FORM 1930-1987: FOCUS ON BLACK HOLLYWOOD MUSICALS, BLACK CONCERT DANCE, AND WHITE BALLET AND THE INFLUENCE OF THESE FORMS ON CURRENT DANCE LITERACY AND CHOREOGRAPHY.

This symposium will illuminate historical, aesthetic, and cultural trends in White Ballet and Black Concert and Musical Theater Dance which have influenced current perceptions of aesthetic, technique, and expression in Ballet, Modern, Jazz and Musical Theater. Examination of the Littlefield Ballet from 1935-1942 establishes the environment from which dance was viewed and through which dance was allowed to develop as serious American art form. An examination of the Black stereotype in the Hollywood musical and an investigation of the recent past as it affects current and future artistic maskings and proceedings will be the content of this symposium. Historical dance research has expanded to include phenomenological and descriptive studies which attempt to analyze and discuss the interrelated and separate issues of cultural and aesthetic influence which affect so directly an understanding of dance both as a performing art and an educational medium within the past and within contemporary society.

CATHERINE LITTLEFIELD: A MAKER OF AMERICAN BALLET. Dr. Nancy BrooksSchmitz, Dance Department, Teacher's College, Columbia University.

The purpose of the study was to examine the work of Catherine Littlefield, founder director, teacher, dancer and choreographer of the Philadelphia Littlefield Ballet Company from 1935-1942. The repertory of Littlefield focused on the athleticism of American dancers, especially that of the male members of the company. She dreamed of American ballet as a form equal in status but different from Russian Ballet and worked to fulfill that dream. Her efforts helped to pioneer modern American Ballet and the decentralization of ballet through regional ballet companies. Using historical methodology, utilizing surviving documents including reviews, programs, newsclippings, photographs, and interviews with company members, the study examined the creation of the Littlefield Ballet Company and the development of her choreography as a reflection of American society during that time period.

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Sunday, April 10
9:00-10:15 a.m.

DEFINING THE BLACK STEREOTYPE: IMAGE OF THE BLACK PERFORMER IN THE HOLLYWOOD MUSICAL, 1930-1950. Luke Kahlich, Kansas State University.

The paper explored the creation of the Black film stereotype in the late 1800's and its development into a standard repertoire of film roles to which Black actors were doomed. Major films of both Black and White directors and producers are cited, with an emphasis on the all-Black musical genre from 1930-1950. The presentation is accompanied by selected film clips to illustrate the stereotypes which dominated the Black performer's life in the musical film. Special reference is made to the use of dance within the film-musical genre to fulfill and propogate the Black racial stereotype.

BLACK DANCE IN THE UNITED STATES: THE RECENT PAST, 1970-1987. Dr. Lynne Emery, California State Polytechnic University, Pomona.

The purpose of this research was to examine the trends and invesitgate the influences of Black Dance on the dance in the United States between 1970 and the present. Included in the investigation was concert dance, dance within the musical theater and mass media, and vernacular dance. It was found that the uniqueness of American dance is due to the adoption of Black Dance into the mainstream of dance and the influence of Black Dance is stronger during this period than at any other time in history. There appears to be a trend toward integration of Black Dance and dancers into those dance forms investigated.

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CRITICAL ISSUES CONFRONTNG THE DISCIPLINE AND PROFESSION OF PHYSICAL EDUCATION: AN INTERDISCIPLINARY VIEW

The purpose of this symposium is to provide an opportunity to discuss the critical issues confronting the field of Physical Education as we move toward the next century. During the last twenty years the field of physical education has been characterized by progressive and regressive events of dramatic proportions. Progressive events such as the development of physical education as an academic discipline with areas of specialization has resulted in physical education enhancing its academic reputation in higher education. Such research specialization, however, has also resulted in a degree of fragmentation within the field and controversy concerning the relative value of basic research, applied research and professional preparation. Concurrent with these internal debates Physical Education has experienced considerable pressure from educational administrators. Administrators at all levels of education expect physical education to demonstrate the unique contribution it can make to the curriculum and research experiences of students. Additionally, departments such as psychology, philosophy, sociology and physics have begun to systematically research topics germane to physical education and in some instances have established course offerings in areas traditionally researched and taught by physical educators. These issues will be discussed by recognized experts from a variety of the subdisciplines within physical education. Current research trends and practices will be examined and suggestions on how the field of physical education can best confront the current challenges and those that will emerge in the near future will be advanced.

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Sunday, April 10
10:45-12:00 noon

CRITICAL ISSUES CONFRONTING BIOMECHANICS. Marlene J. Adrian, Department of Kinesiology, University of Illinois, Urbana, IL

This presentation consists of three parts: historical data, descriptive status data, and philosophical research. Historical data consists of the redefinition of kinesiology and the emergence of biomechanics internationally and across disciplines. The status of the professional organizations and the relationships of these organizations to the kinesiology academy, to professionals in colleges and universities, coaches and teachers, and to AAHPERD will be addressed utilizing a model developed from major writings of biomechanics researchers. A synthesis of the literature in which issues confronting the biomechanics researcher have been cited and interpreted will be presented. Finally, the issues will be treated from a philosophical perspective culminating in a plan for confrontation of some of the issues.

PHYSICAL EDUCATION AND PHILOSOPHY: STRENGTHENING PRODUCTIVE RELATIONS. Warren Fraleigh, Department of Physical Education and Sport, State University of New York - College at Brockport.

The philosophical study of physical education and sport has been examined for ages in a formal and informal sense. While much can be gained from the philosophical perspective several problems exist in the contemporary field. These problems include broad issues such as the focus of appropriate philosophic scholarship for physical education professors, the lack of widespread understanding and respect for philosophical inquiry within the fields of physical education and sport, a general expectancy that philosophical inquiry should translate to immediate applicability in research, teaching and coaching and a lack of colleagial exchange with scholars from the discipline of philosophy. These critical issues will be addressed from a positive perspective that emphasizes strengthening and enhancing the training, current practices and future directions of philosophy in the physical education discipline and profession. Potential suggestions for enhancement include the facilitation of scholarship in the philosophical analysis of physical education and sport, development and promotion of rigorous undergraduate and graduate study of philosophy in physical education, examination of the hiring and assignment practices of individuals in the philosophical area and an analysis of how organizations, publications and professional conferences can be utilized to advance meaningful contributions in the philosophical area.

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CRITICAL ISSUES CONFRONTING PHYSICAL EDUCATION IN HIGHER EDUCATION. Beverly J. Becker, Department of Physical Education, Skidmore College, Saratoga Springs, NY

Higher education is being challenged from outside the academy as well as inside. Who would have predicted that two of the best sellers on the New York Times Book List would be criticisms of education? That the Secretary of Education would continually attack colleges and universities? Once again we are in a reactive rather than proactive mode. What are the fundamental issues facing higher education and physical education within higher education? Is there a future for physical education within higher education? The issues of liberal vs. professional education at the undergraduate level, leadership development, professional preparation for teaching, the "new" specialist in the professoriate, and the basic instruction program will be explored in an attempt to answer the question of physical education's future in the higher education setting.

CRITICAL ISSUES CONFRONTING THE SOCIOLOGY OF SPORT AND PHYSICAL EDUCATION. George H. Sage, School of Health, Physical Education and Recreation, University of Northern Colorado

A number of critical issues face physical education in the coming decade. Increasing national attention to physical activity for the enhancement of health and lifestyle promises to provide excellent opportunities for physical education. The maturity now present in the human movement sub-disciplines suggests an important and growing role for contributing to the preparation of physical educators. One of the major issues that needs discussion, debate, and resolution is how to orchestrate the knowledges and understandings from the sub-disciplines and the needs of professional preparation. Subject matter in the biosciences and pedagogical studies forms the basic academic subject matter of most physical education programs today. A major shortcoming of these programs, however, is the inadequate attention to the social studies of physical activity. Play, games and sports are cultural practices and the range of issues addressed in sport studies explores changes that are occurring in the logics and patterns of social and cultural organization in society. They also address interpretative and evaluative questions about the relationship of social change to differential life chances and various forms of consciousness characterizing different individuals and groups in society. Play, games, leisure, and sports have more to them than technical knowledge and practical skills; they are components of popular culture. If physical education is going to play a leading role in fashioning new directions in play, games, and sporting activities in the years to come, its practitioners will need increasing understanding and sophistication about the sociocultural role of these activities.

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CRITICAL ISSUES CONFRONTING CONTEMPORARY MOTOR LEARNING. Robert W. Christina, Department of Exercise and Sport Science, The Pennsylvania State University

This presentation has three main purposes. The first is to briefly assess the current status of our motor learning knowledge in relation to the potential it has for helping us to find immediate solutions to practical problems. The second is to discuss the view that has been the dominant force in guiding our research efforts in motor learning for approximately the past twenty years. The third is to argue that we need to change the view and increase our effort to conduct applied research which attempts to build a specialized body of knowledge directed toward understanding the learning of skills in sport and physical education settings. This applied research effort is desperately needed mainly for three reasons. First, direct application of fundamental knowledge from basic research to practice usually does not work without at least one if not more intervening steps of applied research. Second, applied research has a great potential for contributing to the development of fundamental knowledge and hence, hastening the progress of motor learning becoming further advanced as a basic science. And third, the specialized knowledge it produces constitutes a much needed rational basis for the profession of physical education. This relevance of our subdivision to the profession would demonstrate its importance to colleagues, administrators, and practitioners some of whom could be in a position one day to determine its future. As a science our subdiscipline is currently controlled by the availability of funds, the consensus of the scientific community, and university committees. Moreover, values intrinsic to basic-science research on motor learning are being challenged more and more today by people who pay for it. It is clear that we are living in an age of increasing accountability largely because of the decreasing availability of funds. A solid applied research effort would enrich our subdiscipline during these difficult economic times in which university administrators are looking for programs to eliminate.

SPORT PSYCHOLOGY CONFRONTS A MAJOR DEVELOPMENTAL CROSSROAD. John M. Silva, Department of Physical Education, University of North Carolina, Chapel Hill, NC

The field of sport psychology has grown as rapidly as any "new" subdiscipline in the field of physical education. During the past five years the number of professional organizations serving sport psychology has tripled. While such growth has many positive aspects, significant challenges currently confront sport psychology as a subdiscipline in physical education. These issues include the lack of meaningful research paradigms, the training of sport psychologists in physical education departments as researchers and consultants, the certification of sport psychologists and the recent trend of offering sport psychology training through psychology and counseling graduate departments. These issues will be detailed and suggestions advanced to maintain and enhance the integration of sport psychology into the profession and discipline of physical education.

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CONTRIBUTIONS OF THE FOREARM AND SHOULDER MUSCULATURE TO ARROW RELEASE IN SKILLED AND LESS-SKILLED ARCHERS.

Philip E. Martin, William L. Siler, and Dean Hoffman, Exercise and Sport Research Institute, Arizona State University

There is considerable speculation, but little data that indicates how muscles of the upper extremity contribute to archery shooting, particularly arrow release. The purpose of this study was to examine the contributions of selected muscles of the draw arm for two groups of experienced archers differing in performance level. Subjects included 13 high performance (HP) archers (X_{age}=23.5 yrs, $X_{1986\ FITA}$=1219) and 10 intermediate and low performance (ILP) archers (X_{age}=18.7 yrs, $X_{1986\ Fita}$=1050). Surface electromyography techniques were used to quantify the activity of the flexor and extensor digitorum, anterior and posterior deltoid, and trapezius muscles for a two second period beginning 1 second prior to arrow release as each subject performed 6 shots. Raw EMG signals were rectified, integrated for twenty 100ms intervals, and normalized relative to isometric maximum actions. Results demonstrated that changes in muscular contributions occurred mainly in the brief periods (100-200ms) immediately preceding and following arrow release. Seven of the 13 HP archers showed a distinct increase in extensor digitorum activity immediately preceding release thereby reflecting an active finger extension response. The remaining 6 HP archers displayed a relaxation release as both flexor and extensor digitorum activity decreased rapidly just prior to release. In contrast, nearly all of the ILP archers (9 of 10) displayed an active finger release pattern. The posterior deltoid and trapezius of nearly all subjects were highly active until just prior to arrow release at which time both muscles showed a rapid decline in activity. For the anterior deltoid, approximately half of the HP and ILP archers showed an increase in activity just prior to release, whereas the remaining archers essentially showed little change until after release. These findings suggest that the shoulder muscles may contribute to a smoother arrow release by reducing the backward pull on the string immediately preceding release. The fact that there was considerable variability in the observed EMG patterns both between and within the two performance groups, however, suggests that it may be more important to consistently reproduce muscle contributions than to display a specific activation pattern for each muscle.

[Supported by a grant from the U.S. Olympic Committee]

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Thursday, April 7
9:00-9:15 a.m.

AGE-RELATED DIFFERENCES IN VERTICAL AND ANTERIOR/POSTERIOR IMPULSES DURING WALKING.

Michael Mungiole, Philip E. Martin, and Douglas D. Larish
Exercise and Sport Research Institute, Arizona State University.

While it is generally accepted that there are considerable changes in walking mechanics as an individual ages, there has been little attempt to examine the gait kinetics that underlie these changes. The purpose of this study was to determine if there are age-related differences in impulses necessary to generate the walking cycle when walking speed is controlled. Ground reaction forces (GRF) were obtained for 13 old (M = 73.5 yrs) and 15 young (M = 27.5 yrs) subjects as they walked across a force platform at 0.81 and 1.34 m/s. GRF data was then used to quantify vertical (V) and anterior/posterior (AP) impulses normalized to body weight (BW). The results are summarized in the following table:

	0.81 m/s		1.34 m/s	
	young	old	young	old
V impulse/step (BW s)	.759	.693	.561	.497
AP impulse/step (BW s)	.0580	.0502	.0669	.0506
contact time (s)	.993	.918	.705	.632
contacts per km	1478	1529	1208	1280
V impulse/km (BW s/km)	1122	1060	678	636
AP impulse/km (BW s/km)	85.7	76.8	80.8	64.8

The results indicated that the old group had lower V and AP impulses with each step at both speeds. Because of lower contact times for the old, the total impulses over a 1 km distance were determined for both groups. As a result, age-related differences for the total impulses were reduced but the old still displayed lower values as compared to the young. One potential explanation for the lower impulses of the old is that they were trying to economize with respect to energy expenditure while walking. Reduced impulses would be equivalent to reduced momentum changes or smaller center of mass velocity fluctuations. Alternatively, the old may display a gait pattern that reflects an attempt to optimize the forces encountered by their musculoskeletal system based on the physical properties of the involved tissue. For example, the reduced bone mineral content of older adults due to osteoporosis may be a likely contributing factor to their desire to reduce bone strain. Further research will be needed to determine the mechanism which best explains the reduced impulses for the old subjects.

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Thursday, April 7
9:15-9:30 a.m.

DETERMINATION OF GAIT ASYMMETRY USING AN IN-SHOE PRESSURE SYSTEM.
Kathy J. Simpson, University of Georgia; Janet S. Dufek, University of Oregon; Julie A. Abendroth-Smith, University of Oregon; Barry T. Bates, University of Oregon.

Asymmetrical gait patterns have been shown to exist as structural variances or pathological impairments. The evaluation of specific shoe-foot pressures can be utilized to concisely compare lower extremity mechanics. The purpose of the study was to evaluate and compare the interday symmetry of selected gait mechanics using the Langer Electrodynogram System (EDG). Four male subjects were instrumented with 7 EDG sensors (lateral and medial heel, first, second, third and fifth metatarsal heads, and hallux) and fitted with laboratory walking shoes. Data were collected for 50 trials at 100 Hz. Fifty additional trials were performed one week later. Walking speed was monitored over a 10 m interval divided into 3 sub-intervals at 6.00 +/- 0.24 km/hr. Maximum pressures and relative times of occurrence for all sensors and the absolute stance time were evaluated. Asymmetry was determined by statistically comparing ($p<.05$) the left and right foot values using a within-subject statistic (Model Statistic). Absolute stance times were similar for both extremities. Asymmetrical pressure and time values were detected for 50% and 70%, respectively, of all trials and sensors. However, only 25% and 15% of these values demonstrated consistent asymmetry when data from both days were compared. Comparisons reflecting gait symmetry demonstrated greater interday consistencies for both pressure (20-75%) and time values (67-100%). Interday consistency of asymmetry was subject and sensor dependent. Greatest pressure consistencies were demonstrated by the fifth metatarsal (75%), medial heel (80%) and first metatarsal (100%) sensors. Bates, et al. (1987) have suggested that individual sensor placement and behavioral variance increase interday variability. Constraining walking speed reduces variability as demonstrated by the similar stance times of both extremities. It is suggested that comparisons of lower extremity mechanics be evaluated over several test sessions to accurately assess asymmetry. Asymmetric gait mechanics can be detected with an in-shoe pressure system, however future studies are necessary to determine an optimal assessment protocol.

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Thursday, April 7
9:30-9:45 a.m.

FOOT PRESSURE AND TEMPORAL PATTERNS IN OVERGROUND AND TREADMILL WALKING. Janet S. Dufek, Barry T. Bates and Patricia E. Geier, University of Oregon.

Conflicting data have been presented regarding the biomechanical similarities and differences between treadmill (TM) and overground (OG) locomotion. Previous research on TM and OG locomotion has primarily evaluated the kinematics of gait. The purpose of this study was to compare in-shoe pressures and selected temporal characteristics of the gait cycle during TM and OG walking using the Langer Electrodynogram (EDG) foot sensor system. Ten volunteer subjects (5 male and 5 female) were instrumented with 7 EDG sensors per foot: lateral and medial heel, heads of the first, second, fourth, and fifth metatarsals and hallux. Data were collected (100 Hz) for 10 trials while walking on a TM and over a hard tiled floor (6.00 +/- 0.25 km/hr.) The first 25 complete steps per foot were analyzed using a single subject statistical technique ($p < .05$) and the results collapsed across subjects. Individual subject sensor values were combined to form 3 descriptive parameters: rearfoot (RF = lateral + medial heel), lateral forefoot (LF = fourth + fifth metatarsal heads), and medial forefoot (MF = first + second metatarsal heads). Maximum RF pressures resulted in the greatest number of significant pressure differences between conditions (72.5%) with mean TM pressures being greater than OG pressures (15.3 vs 14.9 N/cm^2). LF and MF pressures were greater for the OG condition (11.4 vs 11.2 and 18.5 vs 18.3 N/cm^2) with 62.5 and 67.5% significant comparisons, respectively. The time of sensor activation for the RF sensors produced 75% significant comparisons compared to 72.5 and 65% for the LF and MF times, respectively. Mean relative activation times were 45.2, 73.2 and 67.0% of support time for the RF, LF and MF sensors. OG walking produced longer relative contact phases (14.9 vs 12.7%) and shorter propulsive phases (29.7 vs 33.2%) while the midstance phases were nearly equal (12.9 vs 12.2%). In summary, statistically significant maximum RF, LF and MF pressures and durations of pressure were observed between TM and OG walking. Differences were also found between the contact and propulsive phases. These findings suggest that performance differences do exist between TM and OG walking.

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Thursday, April 7
9:45-10:00 a.m.

VALIDATION OF MANUAL VIDEO ANALYSIS SYSTEM. Sarah L. Smith, Steven G. Risenhoover, U.S. Olympic Committee; Phillip J. Cheetham, Gary L. Scheirman, Peak Performance Technologies.

The purpose of this investigation was to validate linear mesurements obtained from a manual video analysis system with corresponding measures obtained from 16mm film. A secondary purpose was to compare the results from both the film and video analysis systems with known values. A 3-way ANOVA was used to compare the average values of selected segmental lengths which were computed from tape and film digitized coordinates. Nine identical test patterns of reflective markers representing 12 segments were recorded by a video tube, video CCD, and 16mm cameras using the same 25mm lens. The width of the field of view was approximately six meters.

The manual video digitizing system was comprised of an IBM XT computer, Panasonic AG-6300 VCR, Sony PVM1910 monitor, a Summagraphics Bit Pad 2 digitizing tablet and the appropriate frame grabber and VCR controller boards. The frame grabber was capable of grabbing a video frame in real time at a resolution of 512 x 512 pixels after it had been processed by a time base corrector. Once the video frame was grabbed, it was split into two fields by software. Each field was viewed separately with the lines from the missing field being filled by interpolation. The digitized tape data were corrected by an aspect ratio appropriate for the particular video camera. Film data were obtained through traditional cinematographic procedures.

Factors within the study were digitizing person, type of analysis system, and section of the field of view. Results of the 3-way ANOVA showed no significant differences for the three main effects and all interactions. Data from none of the three imaging systems (video tube, video CCD, film) differed significantly from known values.

It can be concluded that manual video analysis systems provide valid measures in comparison with known values or film values.

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Thursday, April 7
10:00-10:15 a.m.

THE INFLUENCE OF DARWINISM ON THE EARLY LEADERS IN AMERICAN PHYSICAL EDUCATION, 1860-1918. Nancy C. Dosch, University of Maryland.

This research examined the influence of Darwinism on the writings of the early leaders in American physical education from 1860-1918. The study was based, for the most part, on primary published sources: books, magazines, and pamphlets written by the early leaders of American physical education; and on books and magazine articles published in the late nineteenth century dealing with Darwinism. When Darwinism was studied for its social implications, there was no substitute for reading Charles Darwin's Origin of Species and The Descent of Man along with the major works of Herbert Spencer, especially Social Statics and Education: Intellectual, Moral and Physical. Secondary sources have also shaped this study: books and biographies of important individuals, as well as studies of major currents of thought of the period, especially Richard Hofstadter's Social Darwinism in American Thought. American physical education benefited, in general, from the increased interest in science that Darwinism stimulated. Specifically, the influence of Darwinism on the early leaders in American physical education can be identified from their writings. This study showed that leaders such as Edward Hartwell, Luther Gulick, and Dudley Sargent relied heavily on Darwinian thought and terminology. They believed that in order for the individual to develop, he must master the same physical skills, i.e., running, throwing, climbing, that primitive man needed to survive. This view provided the impetus for stimulating the growth of a physical education curriculum based on evolutionary science. Athletics and sports, play and recreation were also influenced by Darwinian Ideas of competition and struggle. From an evolutionary view, these activities were believed to be instinctual; the result of selection operating through centuries of evolution. Physical education was seen as an integral part of the individual's preparation for life.

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Thursday, April 7
10:45-11:00 a.m.

THE EMERGENCE OF PHYSICAL TRAINING AND SPORT FOR WOMEN AT THE UNIVERSITY OF CALIFORNIA, 1890-1919: THE ROLE OF PHOEBE APPERSON HEARST. Paula R. Lupcho, University of California, Berkeley.

A consequence of the general social concern over health issues during the 19th century was the importance of philanthropic contributions to the development of physical education in the United States. One of the best known examples of this was the work of Mary Hemenway of Boston. This present study is concerned with the role of Phoebe Apperson Hearst, first woman regent of the University of California, and the development of physical education and sport for women students at the university. In 1886, the Department of Physical Culture was founded. However, due to lack of facilities and staff, female students had been precluded from gymnasium work. But interested women students had pressed for similar opportunities and in 1888 two voluntary classes were offered. These classes were held in the one facility on campus, Harmon Gymnasium, and conducted by Walter E. Magee, Assistant in Physical Culture. After the death of her husband, Senator George Hearst, in 1891, Mrs. Hearst became very much interested in the future and growth of the University of California, becoming its most significant benefactor until her death in 1919. She concerned herself with the welfare of women students, especially in matters pertaining to their physical well-being, reflecting the views of contemporary physical educators. She directed her attention to the absence of facilities for women and immediately took steps to have adjacent land deeded to the university. She then moved her own near-campus residence onto this land and refitted it to serve as a gymnasium and social center. Mrs. Hearst also provided salaries for Mary Bennett Ritter, M.D. (the first female Medical Examiner and Lecturer in Hygiene) and two young female instructors in the Department of Physical Culture. With the gift of the building in 1901, Mrs. Hearst expressed to University President Benjamin Ide Wheeler her wish to add physical education as a requirement for female students. This historical research specifically investigates the role of Phoebe Apperson Hearst in the development of the University of California, with particular focus on the development of physical education and sport for women. In the pursuit of this investigation a wide variety of published sources were consulted, including: University of California President's Reports, College Catalogs, and local newspapers. Additionally, relevant archival materials, such as the Phoebe Apperson Hearst Papers and the University of California Regents' and Presidents' Papers were utilized, as were Programs of Dedication and various departmental records.

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Thursday, April 7
11:00-11:15 a.m.

THE HOOVER YEARS: CONTRIBUTIONS TO HEALTH PROMOTION 1914-1932

Susan J. Koch, University of Northern Iowa.

The opening for public study of the Hoover personal papers in the spring of 1985 and Lou Henry Hoover's induction into the Iowa Women's Hall of Fame in 1987 have led to renewed interest in that period of American history which includes the Hoover presidency. Lou Henry Hoover, a native Iowan and the first woman to graduate from Stanford with a geology degree, is remembered especially for her involvement with the Girl Scouts of America. Much less recognized, yet also of great significance, were Mrs. Hoover's contributions to health promotion for children in the U.S. and abroad. The purpose of this research, conducted at the Hoover Presidential Library in West Branch, Iowa, was to explore the involvement of, primarily, Lou Henry Hoover, and also her husband, in the child health movement from 1914 through the Hoover presidency of 1928-32. Although neither were health professionals, both Herbert and Lou Hoover had unprecedented opportunity to observe the human condition all over the globe during their travels as geological engineers. The day after their wedding, by a Catholic priest in 1899, this Quaker couple set sail for China. Their oldest son, born in 1903, had traveled around the world twice before his first birthday. The major contributions of the Hoovers to health promotion can be delineated into three major areas. The first was their leadership of the Belgian and European Relief effort during World War I. They applied their engineering efficiency to the challenge of feeding 10 million people in occupied Belgium and France. Herbert Hoover was a founder and served as the first president of the American Child Health Association in 1920. This organization did the first extensive survey research on the status of child health in the U.S. School health education was a major focus on their agenda. Finally, the Hoover presidency included sponsorship of the White House Conference on Child Health and Protection in 1930. The conference initiated a wealth of health promotion activities for children both in the public health arena and in school health education.

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Thursday, April 7
11:15-11:30 a.m.

COACHING AND ATHLETICS IN THE SOVIET UNION: A VIEW FROM INSIDE THE SYSTEM. Stephen C. Jefferies, Central Washington University

The purpose of this study was to examine perceptions of the organization and functioning of selected aspects of the Soviet sport and physical culture systems. Subjects consisted of 12 Soviet emigres now living in the United States who within the last ten years had worked as full time professional coaches in the U.S.S.R. Personal, 2-3 hours interviews guided by a loosely structured questionnaire, were conducted in Russian by the investigator. Interviews were taped for later transcription and analysis. The investigation provided a unique insight into the informal living and working conditions of Soviet coaches and athletes in socialist society. In addition to insights on life and career opportunities in athletics, the interviews covered such topics as sport organization and administrative policies, how coaches and athletes are selected and trained, what motivates Soviets to excel in athletics, the reward structure for athletic excellence, selection methods for representative teams, mass sport opportunities, and distinctions between professional and amateur sport. Subjects also provided perceptions of differences between Soviet and American sport systems. Among the most fascinating findings was a frequent endorsement of the superiority of Soviet coaching methods and a belief that opportunities for developing the talents of young people were generally more available in the Soviet Union than in the United States. In summary, the study revealed insights of daily life and working conditions within the Soviet sport system previously hidden from Western sport specialists.

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Thursday, April 7
11:30-11:45 a.m.

THE ATHLETIC EXEMPLAR AS CHANGE AGENT: AN EXPLORATORY STUDY

Paul E. Dubois, Bridgewater State College

Athletes have often been envisioned as the embodiment of the heroic ideal. As such, they are believed to be imbued with personal traits and qualities that make them desirable and powerful role models for young people. Consequently, athletes - particularly elite professional athletes - are frequently the vehicles of choice whenever efforts are made to influence adolescents and preadolescents to develop morally and ethically correct attitudes and behavior. There is currently little empirical evidence, however, concerning the ability of the athletic exemplar to modify the attitudes and behaviors of young people. Thus, it was the purpose of this study to determine the effect of a "one shot" presentation by a professional athlete on subsequent attitudes and behaviors of public school students concerning school work and substance abuse.

The subjects consisted of 550 male and female students from middle, junior and high schools in Eastern Massachusetts. Nearly 50% of the students participated in an organized sports program. The treatment consisted of a 40-50 minute presentation at the students' respective schools by a well known professional athlete. The themes of the presentation were the importance of an education, the development of good study habits and the need to avoid habits - substance abuse in particular - that can detract from academic success. The subjects were administered a fifteen item, forced choice survey prior to and 10-12 weeks after the presentation. The survey contained items which assessed the students' attitudes and behaviors regarding (a) the importance of education, (b) study habits and (c) substance abuse.

The data indicated that the younger the student, the more responsive he/she was to the message of the athletic exemplar. Possible differences between athletes and nonathletes were also investigated but virtually none existed. Some competing hypotheses to the findings are discussed, and recommendations for further research provided.

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Thursday, April 7
11:45-12:00 noon

THE RELATIONSHIPS BETWEEN THE SIT AND REACH TEST AND CRITERION MEASURES OF HAMSTRING AND LOW BACK FLEXIBILITY IN MALES AND FEMALES AGES 20 TO 45 YEARS. Allen Jackson, North Texas State University and Nancy Jane Langford, Medical City Hospital, Dallas, Texas.

In 1986 Jackson and Baker reported that the sit and reach test demonstrated moderate validity as a measure of hamstring flexibility but was not a valid measure of low back flexibility in females aged 13 to 15 years. The purpose of the present investigation was to determine the generalizability of those findings in adult males and females. The sample of the study consisted of 52 males and 52 females with an age range of 20 to 45 years. They were administered three tests; 1) the sit and reach test following the procedures of the AAHPERD Health Related Fitness Test, 2) a clinical test of hamstring flexibility which used a passive straight leg raise with range of motion recorded in degrees by a manual goniometer, and 3) a clinical test of low back flexibility which measures the change in distance from selected spinous processes from an erect position to a position of maximal anterior flexion. Two complete trials of each test were administered in a counterbalanced order. Intraclass correlations revealed reliability estimates exceeded .95 for the three tests. The average value across both trials (both legs for one hamstring test) was used in subsequent statistical analyses. Criterion related validity coefficients (r) for the sit and reach test with the clinical measures are given in the following table.

Sample	Hamstring	Low Back	
Males	.89*	.59*	
Females	.69*	.12	* $p<.01$

The sit and reach test is included in the HRFT as a measure of hamstring and low back flexibility. The validity coefficients determined in this study suggest that the sit and reach test is an acceptable measure of hamstring flexibility for adult males and females. In the male sample the significant but moderate correlation between the sit and reach test and the low back flexibility measure results in a shared variance of only 35%. In the females the correlation is extremely low and indicates the sit and reach is not a valid measure of low back flexibility which is in agreement with past research on younger females. These findings suggest that the sit and reach test has questionable validity as a measure of both hamstring and low back flexibility.

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Thursday, April 7
2:00-2:15 p.m.

MEASURING COMPONENTS OF FITNESS AS LATENT TRAITS. **Margaret J. Safrit, University of Wisconsin; Linda M. Hooper, University of Colorado; M. Glaucia Costa, Universidad Federal de Minas Gerais; Zhang Liru, University of Iowa; Zhu Weimo, University of Wisconsin.**

Item response theory (IRT), a measurement theory receiving intense study in recent years, is a powerful alternative to classical test theory for the development of tests in physical education and the exercise sciences. In this study, IRT was used to solve some of the problems associated with a measure of physical fitness, the sit-ups test. Combinations of tests representing eighteen versions of the sit-ups test were administered to a large number of examinees. Test scores were linked so that IRT parameters could be estimated for all examinees. A 2-parameter logistic IRT model was used to estimate two item parameters, difficulty and discrimination, and a person parameter, ability. It was then possible to compare tests and examinees on the same scale. In addition to the parameter estimates, other information was used to analyze the data: reliability, test information function, and intertest correlations. The results of this study demonstrated that no single sit-ups test provided maximum information about abdominal strength/endurance across a wide range of ability levels. Thus, for most efficient testing, several tests should be selected, each one functioning maximally at different ability levels. Although administering several sit-ups tests would not be feasible in most mass testing situations, these results can be used to select the test that has greatest validity and functions maximally at an average ability level. The data were reanalyzed using the same model but with a different computer program. The results demonstrated similarity between the ordering of parameters across analyses.

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Thursday, April 7
2:15-2:30 p.m.

SETTING THE SUCCESS CRITERION FOR A TRIALS-TO-CRITERION TEST.

Bethany Shifflett, San Jose State University.

The purpose of this study was to ascertain what factors should be considered in setting an appropriate success criterion for a trials-to-criterion test (TTC). To determine what issues need to be addressed, results from recent work that examined relationships among success criterions, reliability estimation, domain score estimation, test length, sample size, and distribution of ability were reviewed first. Secondly, this study was devoted to an examination of how varying the success criterion affects test difficulty. Since TTC testing is a relatively new approach to assessment for many physical educators, the possibility exists that the success criterion may be mistakenly associated with the more familiar cut score in criterion-referenced (CR) testing. In CR testing, varying the cut score has a direct and critical effect on test difficulty. However, the success criterion in a TTC test affects only test length, not difficulty. To demonstrate this, TTC test data was generated through computer simulation for 500 hypothetical examinees, drawn from a population with a negatively skewed distribution of ability, using success criterions that ranged from four to twelve. For each success criterion an average phi value, variability of phi values, and average test length from the generated data were recorded. A repeated measures ANOVA with average phi value as the dependent variable showed no significant differences across the repeated measures factor(success criterion). Average test length, as expected, increased with higher success criterions, but based on the simulation results test difficulty was not significantly affected by success criterion. Other issues relevant to setting a success criterion, based on recent literature include 1) if criterion groups are available, a chi square statistic can be used to determine the smallest success criterion that will maximize the differences between groups; 2) as success criterion and sample size increase, reliability increases; 3) When the distribution of ability is negatively skewed, reliability estimated from a TTC test will typically exceed that from a comparable fixed-length test; 4) varying the success criterion does not affect the precision of domain score estimation; and 5) in a CR framework, when mastery decisions are made using a TTC test, CR reliability is not significantly affected by varying the success criterion when sample size is reasonably large.

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Thursday, April 7
2:30-2:45 p.m.

ESTABLISHING RELIABILITY OF BIOMECHANICAL DATA: A MULTIVARIATE APPROACH. Marilyn A. Looney, Northern Illinois University; Sarah L. Smith, United States Olympic Committee.

The purpose of this study was to determine which sources of measurement error contribute most to the measurment imprecision of total body center of gravity (COG) values calculated from film data. In the past, reliability of COG coordinate pairs have been determined separately; however, this approach ignores the covariation that could occur between X- and Y-coordinates. By employing a multivariate generalizability study, the reliability of a coordinate pair can be determined. Twenty-eight college-aged male volunteers were filmed by a LOCAM camera at 100 fps while performing the basic lomomotion skill of walking. Each subject was attired in shorts and athletic shoes so that anatomical landmarks could be identified in the digitizing process. Film analysis was conducted on each subject using 6 frames of film depicting a one stride walking cycle consisting of right heel strike, right foot flat, left toe-off, left heel strike, left foot flat, and right toe off. The film analysis system consisted of a Selecta Frame 5 Bell and Howell 16 mm Analysis Projector and a Numonics 1220 digitizer interfaced through an ADP computer terminal to a NAS-9000 mainframe computer. Nineteen segmental endpoints and a reference point were digitized by three experienced plotters. The digitizing of each landmark was replicated three times by each plotter. A FORTRAN program calculated 9 COG values for each subject filmed in each of the six positions of the stride. The X- and Y-coordinates of the COG values were the set of dependent variables analyzed by a fully crossed 3-way multivariate ANOVA (subjects by plotters by repetitions). All measurement facets were considered to be random. Results indicate that there was very little intra-plotter error but considerable inter-plotter error across all frames. For all decision studies, indices of dependability decreased for Frames 4-6. Fatigue or boredom may have contributed to the decline in performance for these frames. The measurement protocol in which one plotter digitizes each segmented endpoint once resulted in indices of dependability that ranged from .56 to .74. It is recommended that researchers adhere to the following guidelines: (1) use only one trained plotter to digitize all subjects within a study; (2) document the intra-plotter reliability of the plotter using a multivariate approach before he/she begins to digitize data; and (3) no more than eighteen frames should be digitized before taking a break.

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Thursday, April 7
2:45-3:00 p.m.

VALIDATION OF A CHILDREN'S ACTIVITY RATING SYSTEM (CARS). J. Puhl, K. Greaves, T. Baranowski, Univ. of Texas Medical Branch.

Physical activity of children has been assessed using a variety of field data collection methods. However, little information is available to verify these assessments with energy expenditure. We developed a 5 point Children's Activity Rating Scale (CARS) to record and categorize field observations of daily activities of children. Categories were validated by measurements of energy expenditure (steady state oxygen uptake) and heart rate using 25 children 5-6 yrs old (height = 117 ± 5 cm; weight 21.7 ± 3.5 kg; skinfold estimated % fat = 16.2 ± 4.0%; triceps + subscapular skinfolds = 17.0 ± 4.5 mm; $\bar{X}$ ± SD). Each child performed eight different activities (lying, sitting, standing/drawing, standing/ball throwing and catching, and walking at 2.5 mph at 0, 5, 10, and 15% grade). Table 1 shows the CARS, expected and measured heart rates (HR), METS, and % of maximal oxygen uptake (% Max VO_2).

Table 1. CARS vs Heart Rate and Energy Expenditure

CARS	Expected HR (bpm)	Measured HR (bpm)		METS		% MAX VO_2
		Mean	SD	Mean	SD	
1a	<100	89	5.5	1	.14	14.6
1b	<100	94	6.9	1	.12	14.5
2a	100-120	116	7.8	1.44	.21	21.2
2b	100-200	112	8.5	1.54	.28	23.0
3	120-140	126	8.7	2.67	.33	39.8
4a	140-160	141	9.5	3.40	.32	51.4
4b	140-160	162	10.8	4.30	.37	64.6
5	> 160	182	10.1	5.35	.42	80.6

1 MET = 7.05 ml oxygen · kg^{-1} · min^{-1}

Girls were more economical (ANOVA; $p<0.05$) than boys during all walking tests (VO_2 per kg) but not different in other measurements. Interobserver % agreements of CARS values were $\bar{X}$ = 83.1% based on 265 observations ($\bar{X}$ = 34.5 min) over 12 months. Correlations between CARS and HR, METS, and VO_2 were 0.94, 0.97, and 0.96, respectively. These data show that with young children, the CARS categories (a) effectively estimate energy expenditure and heart rate, (b) discriminate between energy expenditure levels, including low levels characteristic of daily activity, and (c) can be used by trained observers to reliably evaluate levels of physical activity.

Supported by NHLBI Grant #5R01 HL35131

The purpose of this study was to validate a children's activity rating system (CARS).

Thursday, April 7
3:00-3:15 p.m.

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THE EFFECTS OF LATERALITY AND MODALITY OF STIMULI UPON RHYTHMIC BEHAVIOR AMONG DEAF ADOLESCENTS. Jennifer H. West and Wendell Liemohn, University of Tennessee.

Neurophysiological models of behavior often cite essential implications of rhythmicity within language and motor control disorders. Consequently, rhythmic perception and training increasingly play an important role in the speech and psychomotor development across many handicapped populations. The objectives of the present study were to extend the previous research on the effects of modality of stimuli upon rhythmic performance by the deaf, but on a much more quantifiable and reliable basis afforded through computer-yielded control; in addition, the effects from the hemispheric lateralization of stimuli in the sensory processing of tactile and visual modalities will be investigated. Subjects included seven females and five males ($\bar{x}$ age, 13.3 years) free of motoric disabilities, and legally classified as deaf with little or no residual hearing. To restrict extraneous receptive language variables, instructions were adminstered via American Sign Language from a prepared script. Subjects were instructed to respond to visual or tactile rhythmic stimuli generated every 750 ms (duration of stimuli-100 ms) by an AIM 65 microcomputer which was also programmed to record alternate right and left hand taps from two circular microswitches. To negate the effects of learning, the modality and laterality of stimuli were counterbalanced. Through a practice trial which preceeded each modality (for a total of twelve trials per subject, r.= .86), subjects demonstrated an understanding of the task and its required response. In the statistical anlyses, the mean of each trial (n = 144) was used in computations of the t-scores.

		$\bar{x}$	S	t-value	p
MODALITY:	Tactile	624.4	107.1	1.751	.039
	Visual	596.6	81.7		
LATERALITY:	Tactile R	627.2	86.3	.378	.354
	Tactile L	634.6	81.1		
	Visual R	589.2	82.7	.848	.205
	Visual L	605.7	82.5		

While lateralization of stimuli did not significantly alter the response of the subjects' performance in rhythmic tapping, the results of the present study suggest that tactile or vibratory stimuli yield a greater facilitation of rhythmic behavior than visual modalities of stimuli among the deaf.

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Friday, April 8
2:00-2:15 p.m.

USE OF IMAGERY PROCEDURES WITH NORMAL AND MILDLY MENTALLY HANDICAPPED INDIVIDUALS. Paul R. Surburg, Indiana University.

While Groden and Cautela (1984) used imagery procedures to modify aberrant behaviors of mentally handicapped (MH) students, little research exists concerning the application of imagery techniques with MH students. There is a plethora of research regarding the use of imagery techniques with normal subjects but comparisons between these subjects and MH students concerning technique efficacy, to date, have not been conducted. Surburg (1984) with MH students and Buckolz and Rodgers (1980) with normal subjects reported that catch-trial (CT) use reduced preparation levels. The purpose of this study was to determine possible effects of an imagery technique on the preparation phase of a motor task with normal and mildly mentally handicapped (MIMH) subjects. Twenty-four normal and an equal number of MIMH adolescents from Bloomington High School North participated as volunteer subjects. Dependent variables were measured as follows: subjects depressed a button following a ready signal, released this button after the onset of a light stimulus (RT) and touched a target disc 48 cm. from the button (MT). At each intellectual level subjects were randomly assigned to no CT group, 30% CT group or 30% CT with imagery procedures group. Subjects in the imagery group closed their eyes before each trial and mentally rehearsed the task. Catch-trial occasions consisted of a warning signal without the presentation of a light stimulus. Preparatory intervals (PIs) of 1.5, 3.0 and 4.5 seconds were presented to a subject. A testing session consisted of 21 trials; four sessions were conducted on separate days. A four-way ANOVA (intelligence x groups x PIs x days) was conducted for RT and MT. Significant main effects were found for intelligence, groups, days and PIs with each dependent variable. With RT significant interactions were: intelligence x PIs, groups x PIs and intelligence x groups x PIs. Groups x intelligence and days x PIs were the significant interactions for MT. Results of the post hoc analyses were that significant differences among the groups were only evident with the MIMH subjects. Thirty percent CT group with imagery techniques and the no CT group were faster than the 30% CT group for both dependent variables. While there were some variations among days and PIs, RT and MT improved over the four day testing period and 1.5 PI elicited the slowest responses. In conclusion imagery procedures facilitated the execution by MIMH subjects of a motor task; normal subjects did not benefit from the use of imagery procedures.

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Friday, April 8
2:15-2:30 p.m.

A COMPARISON OF FITNESS LEVELS OF AMERICAN AND BRITISH VISUALLY IMPAIRED YOUTHS. S. M. Rich, Ithaca College; F. X. Short & J. P. Winnick, SUNY College at Brockport

Historically, comparisons of physical fitness scores between nations have led to the improvement of the fitness levels of each nation's youths. This study was conducted to determine if significant differences in physical fitness levels existed between British and American adolescents with visual impairments. A total of 235 British subjects aged 10 to 17 years who attended schools for the visually impaired during the 1985-86 school year were administered the Project UNIQUE Fitness Test (Winnick & Short, 1985). These scores were compared with the scores of 488 visually impaired American subjects from the original Project UNIQUE national standardization sample. The British and American sample were compared by age, sex, and degree of visual impairment (blind or partially sighted). The American sample was also divided into two groups according to type of school setting -- institutionalized (INST) (n = 353) and noninstitutionalized (NONINST) (n = 135). No students with significant other handicapping conditions were included in any group. Each subject was administered the 6-item UNIQUE battery. Scores were analyzed using a MANCOVA, followed by univariate ANOVA. Nationality, sex, and age were variables and severity of visual impairment served as the covariate. The analysis focused primarily on differences between nationalities. Significant differences at the .01 level were found for all 6 items for nationality, however, there was a significant interaction with gender on one item (dash). Generally, British subjects performed better than American INST and NONINST subjects on tests of grip strength and sit-and-reach. INST American subjects performance was equal or better than their NONINST American peers and British subjects on distance run, dash, sum of skinfold, and sit-ups. The failure on NONINST American subjects to out-perform their INST American peers and British subjects on any of the 6 items raises questions about the efficacy of fitness programs being offered in mainstreamed settings in the United States and the benefits of having specially trained physical educators to provide instruction for visually impaired students.

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Friday, April 8
2:30-2:45 p.m.

A COMPARISON OF THE STAIR STEPPING EFFICIENCY BETWEEN MENTALLY RETARDED AND NONHANDICAPPED ADULT FEMALES. Christine Seidl; David L. Montgomery; Greg Reid; McGill University.

The purpose of this study was to compare the net efficiency for stair stepping at three stepping rates over four test days, between mentally retarded (MR) and nonhandicapped (NH) persons. Thirty female adults served as subjects: 15 MR, and 15 NH women of comparable chronological age to the MR group. Net efficiency of stair stepping was computed as the percentage of the energy output divided by the energy expenditure. Energy expenditure was assessed by the performance of subjects on a portable double stair stepping apparatus. Subjects stepped for six minutes at three progressive work rates with five minute rest intervals, and repeated this procedure on four test days over a two week period. Oxygen uptake was measured by open spirometric techniques using a metabolic measurement instrument. The work output was determined for each subject as the product of mass (kg), step height (m), and frequency of stepping (asc/min). The basic design of the study was a 2 x 3 x 4 (Groups x Stepping Rates x Days) factorial with repeated measures on the last two factors. The groups were MR and NH women. The three stepping rates included: 14, 17, and 19 asc/min. The test was repeated on four days. Net efficiency was the dependent measure upon which to test the stated hypotheses. Results indicated that the NH women stepped more efficiently than MR women ($p < .01$). Mean stepping efficiency was 17.1% for the NH group, and 15.6% for the MR group. The stepping efficiency of MR women did not improve over test days, while the NH women did show improvement at the third and fourth test days. MR women were least efficient at a stepping rate of 14 asc/min, while NH women were least efficient at 19 asc/min. Additional results indicated that 60% of MR women could not complete the third stepping stage (19 asc/min) on the first day, but that the number of MR women capable of completing the third stepping stage increased by 20% over four test days. The results of this study confirmed that MR subjects experience tempo difficulties during stepping exercise, however, cadence adherence at faster stepping rates can improve with practice. The efficiencies of MR subjects on other modes of cardiovascular exercise would be beneficial, as would the development of valid and reliable testing procedures for the evaluation of cardiovascular fitness for these persons.

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Friday, April 8
2:45-3:00 p.m.

Influence of Training on the Relationship Between $\dot{V}O_2$ Max and the 1.5 Mile Run. Bo Fernhall, University of Rhode Island; Garth Tymeson, Northern Illinois University

The little maximal physiologic data available on mentally retarded adults suggest that these individuals have depressed levels of HR max and $\dot{V}O_2$ max. Also suggested is the use of the 1.5 mile run as a valid indicator of fitness with this population. The purpose of this study was to determine and evaluate HR max and $\dot{V}O_2$ max with mentally retarded adults, and to evaluate the relationship between $\dot{V}O_2$ max and the 1.5 mile run. In addition, the influence of training on this relationship was evaluated. 21 mentally retarded adults volunteered for the study ($\bar{x}$ IQ = 58; $\bar{x}$ age = 29.5; $\bar{x}$ wt. = 72.1 kg). Following familiarization with the laboratory and the testing procedures, the subjects completed a walking treadmill protocol starting at 3 mph and 0% grade. With the speed held constant, the grade was increased 2.5% every minute until exhaustion, following a 2 min. warm-up. Metabolic data were collected in one min. increments with a Beckman MCC cart and the HRs were calculated from electrocardiograms every min. The subjects underwent an 8 week training program meeting 3 times per week, in groups of 5-10 subjects per session, utilizing a walking-jogging exercise regime. ANOVAs with repeated measures revealed no change in $\dot{V}O_2$ max (25.5 vs 26.2 $ml \cdot kg^{-1} \cdot min^{-1}$) or HR max (174 bpm vs 173 bpm) with training. The 1.5 mile run time decreased from 23.9 min to 21.9 min but was not significant ($p<.05$). Prior to training the r between VO_2 max and run time was $r = -.79$ with an SEE of 4.35 ($p<.05$). This improved to $r = -.85$ with an SEE of 3.31 following training ($p>.05$). These data confirm earlier research showing that MR adults have depressed HR max and $\dot{V}O_2$ max, which were not altered with moderate aerobic training. The 1.5 mile run is a valid indicator of $\dot{V}O_2$ max both before and after training, but it would appear that training can slightly enhance this relationship, although this enhancement was not statistically significant.

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Friday, April 8
3:00-3:15 p.m.

PERSONAL INVESTMENT PREDICTORS OF EXERCISE BEHAVIOR AMONG ADOLESCENTS. **Marlene K. Tappe, PhD, Patricia Ernwald, MS, Joan Duda, PhD, Purdue University**

This study focused on the motivational orientations of adolescents toward exercise. Personal Investment Theory provided the theoretical framework for this investigation. This cognitive theory proposes that the subjective "meaning" of a context determines an individual's personal investment of his or her time, talent and energy resources. This meaning is comprised of three interrelated components: personal incentives or goals, sense of self, and perceived options. Data regarding each of these components was collected from 237 students from a large midwestern high school. Included in the survey instrument were scales measuring Personal Incentives for Exercise, Health Locus of Control, Self-Motivation, Perceived Barriers to Exercise and Physical Competence. Chronbach's alpha, multiple regression, and discriminant analysis procedures were used to analyze the data. The multiple regression analyses allowed for the prediction ($p<.05$) of the extent of exercise involvement. Significant discriminant function equations allowed for the prediction of adolescents of low and high levels of exercise involvement. The results support the utility of the personal investment approach for examining the motivational aspects of a health-related behavior such as exercise. The information generated can be used to sensitize health educators to the motivational orientations of adolescents toward exercise behavior. This awareness can facilitate health educators as they develop approaches to promoting exercise and other health-related behaviors among adolescents.

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Friday, April 8
3:45-4:00 p.m.

The Role of Efficacy Cognitions in Adherence and Intent to Exercise. Edward McAuley and Thomas Rowney, University of Oregon.

Self-efficacy cognitions have recently been shown to mediate preventive behaviors leading to improved health and functioning in such domains as weight loss, smoking reduction, and post myocardial infarction activity. However, little attention has been paid to the role played by efficacy cognitions in adherence to exercise by healthy, but sedentary adults. This investigation was designed to examine the predictive value of self-efficacy cognitions in fostering adherence to an aerobic exercise program and behavioral intention to exercise when the program was terminated. Sedentary adults (N-96) with a fitness rating of 3 or below (very poor) on a 9-point Likert scale volunteered as subjects for the study. We predicted that subjects with higher efficacy expectations for continued involvement would adhere longer (attend more classes), indicate an intention to participate in other physical activities outside of the program, and to demonstrate greater behavioral intention to continue to exercise in the future once the program was finished. Efficacy cognitions were assessed before and at the end of a 10-week beginning aerobic dance or jogging program. Adherence was assessed through carefully-kept instructor attendance records. Subjects also indicated their intention to continue exercise behavior beyond the end of the program. Coefficient alpha for the efficacy measure was .87. Multiple regression analyses were employed to conduct a path analysis of the hypothesized causal model. Initial self-efficacy was a significant direct effect on adherence, intention to engage in other physical activity, and efficacy cognitions at the end of the program. These cognitions also had indirect effects on behavioral intention to exercise beyond program termination through self-efficacy at the end of the program and intention to participate in other physical activities. These results provide some initial support for the self-efficacy model of exercise adherence in the sedentary adult. This study attempted to understand exercise adherence from a social cognitive theory of behavioral causation, self-efficacy theory. The results are discussed in terms of the nature of the sample and the need to conduct studies that follow exercise behavior beyond program termination.

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Friday, April 8
4:00-4:15 p.m.

STRIVING FOR EXERCISE GOALS: AN EXAMINATION OF MOTIVATIONAL ORIENTATION AND EXERCISE ADHERENCE IN AN UNSUPERVISED SETTING.

Jay Kimiecik, University of Illinois; Sue Jackson, University of Illinois; John Giannini, University of Illinois.

The purpose of this study was to examine the motivational orientations of participants in an exercise club that rewards all members with a t-shirt who achieve an exercise mileage goal in jogging, swimming, or cycling. The club is sponsored by the Department of Campus Recreation at a large midwest university. Members of the club, which holds no supervised group fitness classes, set a goal at the start of the school year and then exercise on their own to achieve it. Most of the exercise adherence research to date has examined participants in structured adult fitness programs. Dishman, Sallis, & Orenstein (1985) have suggested that more research needs to be done on exercisers in different situations. The present study is a step in that direction. Motivational orientation was determined in accordance with tenets of Personal Investment Theory (Maehr & Braskamp, 1986; Kimiecik, 1987) which states that both dispositional and situation-specific orientations play a role in determining a person's personal investment in an activity. A questionnaire was mailed to 120 club members. The 79 members who returned the questionnaire served as subjects for this study. Discriminant analyses indicated that groups defined by age could be distinguished on the motivational orientations for exercise. ANOVAs revealed that young adults (18 to 30 years of age) were more mastery oriented in their exercise situations than both middle-aged (31 to 49 years of age) and elderly (50 or more years of age) club members, although all three age groups tended to have a dominant mastery orientation for exercise. Discriminant analyses also revealed that groups defined by gender could not be distniguished on either their dispositional or exercise-specific motivational orientations. Both females and males placed more emphasis on a mastery orientation than either competitive or affiliative. These results conflict with Duda & Tappe (1987) who found males to be more competitive-oriented than females in a group adult fitness setting. The findings of the present study suggest that individuals who participate in self-sustained, unsupervised exercise situations, regardless of gender, have developed a mastery orientation for exercise and structure their exercise activities accordingly. The findings also suggest that people who join adult fitness programs may be very different in motivational orientation from those exercisers who strive for exercise adherence on their own.

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Friday, April 8
4:15-4:30 p.m.

EFFECT OF FINANCIAL REWARD AND BEHAVIORAL CHANGE/EDUCATION INTER-VENTION ON EXERCISE COMPLIANCE IN COMPANY SPONSORED FITNESS PROGRAMS FOR MALE, WHITE COLLAR, EMPLOYEES. Vicki L. Cleaver, Ron A. Ratliff, & E. Laurette Taylor, University of Oklahoma.

Purpose: The purposes of this study were to: 1) compare the effects of substantial tangible reward ($), 8% of gross pay, and behavioral change/education (BCE) interventions on exercise compliance among businessmen and 2) compare the subsequent residual effect of these interventions on compliance. **Methods**: Three corporations offered company sponsored, early morning, exercise programs consistent with ACSM exercise guidelines (1978), for previously sedentary, white collar employees at "convenient" fitness centers. A 12 month quasi-supervised period with $ and BCE intervention, was followed by 12 months without supervision and intervention, but with continued sponsorship of the fitness center membership. Three groups of 25 non-symptomatic male volunteers, age < 45, with similar demographic characteristics, were initially accepted as subjects from each of the organizations; $, BCE and Controls (CON). The CON group was afforded fitness program membership but no other intervention strategy. The subjects were classified as compliers, (> 2.0/wk); moderate compliers, (1.0-2.0/wk); and non-compliers (< 1.0/wk) based upon their attendance records. **Results**: Comparisons of subjects within each compliance level showed that during the intervention period $ Ss exhibited a significantly ($p < 0.05$) larger number of compliers than CON, and that the rate of non-compliers among BCE and CON groups was significantly higher than the $ Ss. However, the follow-up period showed a significantly higher compliance rate for BCE in comparison to either the $ or CON groups. **Conclusions**: These data indicate that a twelve month BCE or CON program is inferior to providing a "substantial" financial inducement in maintaining early morning exercise compliance during a quasi-supervised program for as long as 1 year; however, in contast, these data suggest that the potential residual effect of the BCE program is superior in maintaining exercise compliance during the 12 month follow-up period once these interventions cease. Furthermore, the highest proportion of non-compliance was observed by the $ Ss during the follow-up period suggesting that tangible ($) rewards may provide less long term stimulus, once the intervention is removed, to maintain compliance than even that demonstrated by the CON group.

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Friday, April 8
4:30-4:45 p.m.

EFFECT OF EXERCISE INTENSITY AND DURATION ON A FOUR CHOICE REACTION TIME TASK. Mark Loftin, University of New Orleans; Robert Eason, University of New Orleans

Physical exercise appears to affect psychological activation along the dimension of the inverted-U. Gutin (1973) has proposed an "exercise induced activation" theory to explain behavior change as a function of physical exercise. Tests of the theory have resulted in contradictory findings in regards to the intensity and duration of physical exercise for optimum reaction time (RT). The purpose of this study was to determine the effects of five exercise intensities and five exercise durations on a reaction time task. Fifteen male adult volunteers were initially assessed to determine VO_2 max during leg cycling using a traditional open circuit spirometry method. A counter balanced design enabled the subjects to perform under all intensity and duration treatments. Intensity loads included the following: unloaded cycling, 25, 50, 75, and 90 percent of individual physical work capacity respectively. Duration effects were determined by one minute RT trial blocks over a five minute exercise bout. RT was ascertained utilizing a Lafayette four-choice reaction time console mounted to the handle bars of a Monark bicycle ergometer. Subjects received 40 training trials of RT while pedalling unloaded at 60 RPM. Prior to each performance, subjects received a twenty trial warm-up. After rest each subject performed four RT's per minute for a five minute bout at the prescribed intensity with pedalling rate held constant at 60 RPM. At least 24 hours separated all trials. The RT data were analyzed by a 5 X 5 ANOVA. The results indicated a significant main effect for duration, $F(4,280)= 6.6$ $p < .05$. An analysis of the means indicated that the third minute of exercise produced the best RT and minutes two and five the worse. A main effect for intensity was not found, $F(4,70)= 2.1$ $p < .08$, although the means were in the direction of the inverted-U. No interaction effect was detected. This study supports the exercise induced activation theory and the inverted-U trend, but not in the same way as reported by Gutin (1973) and Zjoberg (1968) concerning intensity, or Davey (1972) concerning duration.

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Friday, April 8
4:45-5:00 p.m.

THE DEVELOPMENT AND PRELIMINARY VALIDATION OF THE PHYSICAL SELF-PERCEPTION AND PERCEIVED IMPORTANCE PROFILES. Kenneth R. Fox, Northern Illinois University; Charles B. Corbin, Arizona State University.

Although it is widely accepted that self-concept is multidimensional, the content and structure of self-perceptions within the physical domain have not been systematically investigated. The purpose of this study was the development of a reliable and valid multidimensional instrument which reflects the more salient evaluative physical self-perceptions of young adults. This was seen as an essential stage in the exploration of the structural organization and function of the physical self within current theoretical models of self-concept. A total of 1,191 male and female college students were involved in the four phases of this study. Through content analysis of open-ended questionnaire responses, a literature search, and factor analysis of existing scales, four salient subdomains which contributed to overall physical self-worth were first identified. The Physical Self-Perception and Perceived Importance Profiles (PSPP and PIP) were then constructed to measure perceived sports competence, attractive body, physical strength, physical conditioning, general physical self-worth, and their relative perceived importance. The reliability and validity of the profiles was investigated using four independent samples of subjects. Item and subscale descriptive statistics, susceptibility to social desirability, test-retest reliability, subscale coefficient alphas, and item-total correlations were calculated. Principal components and confirmatory factor analysis were used to examine the discriminant validity of subscales. Rosenberg's Self-Esteem Scale and a self report of physical activity questionnaire were also administered and partial and canonical correlational, discriminant and multiple regression analyses used to investigate construct and predictive validity of profile subscales. All analyses were completed to allow gender comparisons. Item and subscale means and distributions were appropriate and stable across samples. Coefficient alphas for the PSPP ranged between .82 and .92. Test-retest coefficients ranged between .74 and .92. A four factor structure for the PSPP subdomain subscales accounted for 63% (males) and 69% (females) of the covariance, with all items loading above .4 on their intended factor. Profiles were able to correctly categorize 70% of active versus inactive subjects. The evidence suggests that the profiles are psychometrically sound, appropriate for both gender and initial relationships support their validity.

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Friday, April 8
5:00-5:15 p.m.

THE RELATIONSHIP BETWEEN PHYSICAL COMPETENCE AND SELF-PERCEPTIONS AMONG CHILDREN OF DIFFERENT AGE LEVELS. Laura L. Borsdorf, Ursinus College.

Numerous studies undertaken to ascertain the relationship between physical variables and self-concept have resulted in equivocable findings, emphasizing a need for research which would examine the multidimentional quality of self-concept, and the potential effects that gender and developmental differences might have upon multidimentionally viewed self-concepts (Sonstroem, 1982). Therefore, this study was undertaken to examine relationships of various profiles of physical factors chosen on the basis of developmental and gender considerations (Corbin, 1985; Harter, 1977), to profiles of multidimentionally viewed self-concepts. Female and male subjects (n=134) from grades one and four were administered domain specific and global self-concept instruments as identified by Harter (1977), and a battery of physical tests representing 3 physical competence areas; structural-maturational, physical ability and physical skill. Gender differences on each self-concept and physical factors profile at each grade level were examined using multivariate analyses of variance and discriminant function analyses. The analyses indicated the presence of significant differences between first grade girls and boys on the structural-maturational, physical skill, and self-concept profiles ($p < .05$), and between fourth grade girls and boys on the physical ability and physical skill profiles ($p < .05$). Multivariate multiple regression analyses examined relationships between the profiles of self-concepts and the profiles of physical variables for each gender at each grade. No significant relationships were observed. However, results did show trends present for all groups in the direction suggested by the literature (Corbin, 1985; Seefeldt, 1980). Presence of the trends lends some support to the notions that complex, socially evaluative physical skills have more impact on domain specific and global self-concepts than do more inherited, less learned types of physical movements, and that as early as the first grade, physical variables, especially physical skill factors, may have some impact upon self-concepts of children. It was concluded that the employed research model warranted refinement and additional research, and that future studies should examine more closely the impact of gender and developmental differences on multi-dimentionally defined self-concept.

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Friday, April 8
5:15-5:30 p.m.

INFLUENCE OF A BASEBALL GLOVE ON THE TYPE OF ERROR PRODUCED IN SIMPLE ONE-HAND CATCHING. Mark G. Fischman and W. Gregory Mucci, Southern Illinois University.

The influence of a baseball glove on the positioning and grasping components of one-hand catching, under both vision impaired and unimpaired conditions, was studied. We desired to check the validity of the Fischman and Schneider (1985) assumption that barehand catching of tennis balls, and gloved catching, such as required in baseball and softball, are similar enough so that positive transfer should be expected between them. Skilled softball and baseball players ($\underline{N}$ = 20) caught tennis balls barehanded and softballs using a fielder's glove. On half the trials vision of the catching hand was blocked by a screen positioned alongside the head. Balls were projected by an electronic pitching machine over a distance of 9.4 m at a speed of 12.07 m/s. All trials were videotaped and errors were categorized by type (position or grasp). A 2 x 2 x 2 (Screen Condition x Hand Characteristic x Error Type) ANOVA on percentage of errors produced a significant three-factor interaction. This indicated that performance was essentially perfect with the glove, regardless of the Screen Condition, but barehand grasping performance was disrupted by lack of vision of the hand to a much greater extent than was barehand positioning. Thus, Fischman and Schneider's (1985) expectation regarding the near-perfect transfer between gloved catching and barehand catching calls for modification. Theoretically, these data imply that proprioception from the responding limb may be sufficient to permit accurate positioning of the hand, in the absence of vision of the hand, provided that certain skill-specific constraints are observed. Use of a baseball glove may also ease the severe timing demands necessary to control the grasp phase of simple catching.

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Saturday, April 9
9:00-9:15 a.m.

RHYTHMIC TAPPING PERFORMANCE: PROCESSING HEMISPHERE, MODALITY AND GENDER EFFECTS. Wendell Liemohn, Craig Wrisberg and Jennifer West, University of Tennessee.

The purposes of this investigation were to determine the influence of (a) hemisphere of initial processing of a stimulus (left or right), (b) modality of stimulus presentation (i.e., visual, auditory or tactile), and (c) gender on reciprocal rhythmic tapping performance. The subjects were 12 female and 12 male right-handed university students. The task involved alternate hand tapping coincident with and following the presentation of the stimuli. Each stimulus had a duration of 100 ms and stimuli were presented at 750 ms intervals. An AIM 65 microcomputer was programmed to generate the stimuli and score intertap interval length to the nearest ms. After one warm-up trial for each modality, three additional trials were given which included a warm-up phase (6 taps with the stimulus), an induction (IP) phase (9 taps with the stimulus) and a continuation (CP) phase (9 taps after cessation of the stimulus). The ordering of trials was counter-balanced by hemisphere of initial processing (i.e., the hemisphere contralateral to side of the stimulus presentation) and modality, with one male and one female subject receiving each of the 12 possible combinations of the two variables. The eight intertap intervals for both the IP and CP were used as dependent variables. In addition, length of intertap interval between L- and R-hand taps and the obverse were also analyzed. Since preliminary tests revealed no effect of hemisphere of initial processing, a 3 (modality) x 2 (phase) x 2 (order) x 2 (gender) ANOVA with measures repeated on all but the last factor was conducted on intertap interval scores. The results indicated that (a) the L-R intertap interval was in all cases significantly shorter than the R-L intertap interval; (b) the difference between the L-R and R-L intertap intervals was significantly greater in the IP than in the CP for the visual and auditory modalities but not for the tactile modality; (c) males had more rapid intertap intervals in the IP while females had more rapid intertap intervals in the CP; and (d) L-R and R-L intertap intervals for females were significantly longer than those of males for the visual modality but not for the auditory or tactile modalities. It was concluded that asynchronous response strategies may be adopted by subjects in situations requiring synchronous reciprocal movements and that males initiate their responses sooner in anticipation of the appearance of visual stimuli than do females.

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Saturday, April 9
9:15-9:30 a.m.

REACTION AND MOVEMENT TIME FOR VISUAL SELECTION. Charles H. Shea, Texas A&M University.

One of the most frequent operations which occurs in the man-machine interaction is the selection of a control function displayed on a terminal. Typically, this operation is executed by manual button press, limb/finger positioning (with touch screens) or the positioning of a "mouse". However, this same operation can be accomplished via other response modalities such as voice and eye position. Thus, the selection of a response modality to be used for application is based, in part, on the speed and accuracy with which the response is elicited. In an attempt to determine the speed and accuracy with which eye position data can be used to select programmed sequences for control purposes, two experiments were conducted. The purpose of the experiments were to compare the time required to select a **screen button** via eye positioning and **hardwire button** by manually depressing a response key in modified choice response time paradigms. Subjects were asked to "look" at a red light in the middle of the computer monitor and informed that 1 to 3 sec after the light turned green that the background of one of the possible alternatives would change to red. Their task was to either depress the appropriate hardwire button or look at the appropriate screen button. In Experiment 1 one, two and four stimulus/button combinations were used. Two hardwire button configurations were used; one had a high spatial correspondence to the stimulus and the other a low correspondence. The results indicated that response time increased as the number of items from which to select increased with the slope of the increase greatest for the hardware button/low correspondence condition and least for the eye position selection-screen button condition (left). In Experiment 2 the layout of the stimuli and screen buttons were arranged to the right, left, top and bottom of the screen and the first finger of the preferred hand was used to select the hardware buttons. This required the subject to move his or her finger from a base position to the appropriate button. Button positions were mapped (left, right, top and bottom of base position) to the stimulus position so as to create a high degree of correspondence. The results indicated screen buttons could be selected visually much more rapidly than hardwire buttons could be located and manually depressed (right). The visual selection processes appeared to present a highly compatible stimulus/response situation with subjects nearly automatically registering their eye on the screen location of interest. Visual selection errors occurred on less than 5% and manual selection approximately 3% of the trials.

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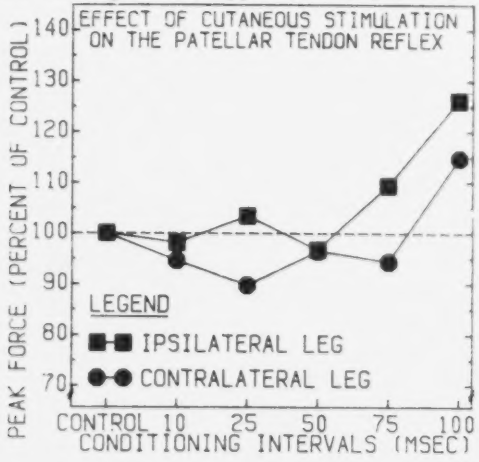
Saturday, April 9
9:30-9:45 a.m.

CUTANEOUS STIMULATION PRODUCES A LONG-LATENCY SPINAL FACILITATION IN THE ELDERLY. J. R. Burke, D. M. Koceja, E. M. Lonardi, and G. Kamen, Motor Control Laboratory, Indiana University, Bloomington, IN 47405.

The purpose of the study was to determine the role of cutaneous stimulation on the spinal excitability in the elderly. The patellar tendon reflex was elicited in five men and ten women between the ages of sixty-six and eighty-two by an electromechanical device. Peak force (PF), contraction time (CT), and half-relaxation time (1/2 RT) were measured by a strain gage placed at the right ankle and recorded on a high speed (200 mm/sec) pen recorder. Electrocutaneous (EC) stimulation (3 times perception threshold, 2 msec duration) was delivered by two silver-plated electrodes to the skin area over either the ipsilateral or the contralateral anterior thigh at intervals of either 10, 25, 50, 75 or 100 msec. prior to the right tendon tap. A 2 x 6 (leg by conditioning interval) ANOVA model revealed a significant conditioning interval main effect for PF ($p < .05$). Dunnett's post hoc test detected that PF at the 100 msec interval was greater than control. The results support a late facilitation of the patellar tendon reflex from homonymous cutaneous stimulation in the elderly as shown in the graph below. A similiar enhancement of the patellar tendon reflex was previously observed in college-aged subjects at the 75 msec conditioning interval. A possible mechanism underlying this facilitation is an increased arousal of spinal motoneurons from cutaneous stimulation, which occurs at a longer latency in the aged. (Supported in part by BRSG S07 RR07031)



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Saturday, April 9
9:45-10:00 a.m.

EFFECT OF AUGMENTED FEEDBACK ON ISOMETRIC STRENGTH DURING FAMILIAR AND UNFAMILIAR MUSCLE MOVEMENTS. James E. Graves, University of Florida; Robert J. James, University of Massachusettes.

To evaluate the effect of augmented feedback on the isometric strength of familiar and unfamiliar muscle movements, 18 male and 21 female college students completed two isometric exercises. One exercise was isometric contraction of the adductor pollicis, a familiar muscle movement. The second exercise was isometric contraction of the abductor digiti quinti, an unfamiliar movement. The exercises consisted of 10 maximum voluntary isometric contractions lasting 10 seconds each and separated by 10 second intertrial rest intervals. Visual biofeedback was provided on an oscilloscope monitor during alternate contractions. The order of exercises and trials for feedback was randomly assigned and balanced over subjects. Reliability of repeated measurements of isometric strength for both exercises, with and without feedback, was high (Cronbach's α values = 0.97 to 0.98). Peak strength during isometric contraction of the abductor digiti quinti was significantly ($p < 0.01$) greater with augmented feedback (4.4 $\pm$ 0.29 kg) than without feedback (4.1 $\pm$ 0.26 kg). Peak strength during isometric contraction of the adductor pollicis with feedback (23.2 $\pm$ 1.09 kg) was not statistically different ($p > 0.05$) from peak strength without feedback (22.5 $\pm$ 1.05 kg). Muscular fatigue was more pronounced during isometric contraction of the adductor pollicis without feedback (18.4 $\pm$ 1.17%) than when feedback was provided (11.8 $\pm$ 1.36%). These data suggest that augmented feedback has a greater influence on isometric strength in the absence of well developed intrinsic feedback mechanisms that exist for familiar muscle movements but diminish during fatigue. To obtain maximal isometric strength measures in a clinical setting, augmented feedback should be provided.

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Saturday, April 9
10:00-10:15 a.m.

POTENTIATION OF DIETARY INDUCED THERMOGENESIS WITH EXERCISE IN LEAN MEN AND WOMEN. Kris E. Berg, University of Nebraska at Omaha.

The purpose of this study was to compare energy expenditure during exercise and the recovery from exercise in five physically active lean men (mean age, % fat, and VO_2 max of 34.8±8.1 yr, 8.1±3.2% and 63.7±8 $ml \cdot kg^{-1} \cdot min^{-1}$, respectively) and five physically active lean women (mean age, % fat, and VO_2 max of 26.2±5.1 yr, 17.6±4.5%, and 50.2±13.6 $ml \cdot kg^{-1} \cdot min$, respectively) while in three states of nutrition. Previous research has indicated that exercise potentiates dietary induced thermogenesis when the energy consumed in a meal exceeds 900 kcal. However, no studies have examined the thermogenic effects of exercise after two smaller feedings. Caloric expenditure was measured by standard open circuit spirometry under three conditions on separate days in random order: (a) 12 h postprandial; (b) 1 h after two 500 kcal feedings seperated by 4 h; and (c) 1 h after a 1000 kcal feeding. All testing and eating was done at the same time of day ± 30 min and each meal was of the same composition (65% carbohydrate, 30% fat, and 15% protein). Subjects exercised for 30 min on a treadmill at 40% of a previously determined VO_2 max. Following each exercise session, subjects sat quietly and read. Expired air was collected and sampled continuously throughout exercise and 1 h of recovery. One-way ANOVAs with repeated measures were used to test for significant thermogenic effects in men and women separately during exercise and recovery, while two 2 x 3 (sex x condition) ANOVAs with repeated measures were used to compare the responses of the males and females during exercise and recovery. No thermogenic effects were observed during exercise but a significant effect occurred in males during recovery ($p < .05$): the two 500 kcal and 1000 kcal conditions resulted in 10.2 and 18.9% more kcal being expended than in the fasting state ($p = .20$ and .03, respectively). The thermogenic response of men was significantly greater during exercise than women when expressed as percent increase in kcal above rest. It was concluded that moderate exercise in lean males potentiates the thermogenic effects of eating in recovery but not during exercise.

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Saturday, April 9
10:45-11:00 a.m.

THE EFFECT OF ENDURANCE TRAINING ON GROSS ENERGY EXPENDITURE DURING STEADY-RATE EXERCISE IN YOUNGER AND OLDER MEN. Andrew W. Gardner, Arizona State University; Eric T. Poehlman, University of Vermont; Donald L. Corrigan, Purdue University.

In a previous investigation we demonstrated a decrease in gross energy expenditure (GEE) during exercise at a given power output (PO) as individuals age. This pattern occurred in both physically active and inactive individuals. Thus, the purpose of the present study was twofold: (1) to compare the GEE during steady-rate submaximal exercise between 20 younger (Y) and 20 older (O) men, and (2) investigate the effect of endurance training on GEE in both groups. The Y (31.2 ± 2.7 years) and O (49.2 ± 4.7 years) groups participated in an 8-month walking/jogging program that met 3 times per week for a duration of 60 minutes per session. Exercise intensity was maintained between 60 and 85% of predicted maximal heart rate during each session. Exercise tests were administered to the subjects at 0, 4, and 8 months into the training program, and consisted of cycling an ergometer at a PO of 100 W for 10 minutes. Estimation of GEE ($kcal \cdot min^{-1}$) was done by measuring the respiratory exchange ratio during exercise to obtain the caloric equivalent of each liter of oxygen consumed ($\dot{V}O_2$). Additionally, the maximal oxygen consumption ($\dot{V}O_2max$) was predicted based on the submaximal exercise heart rate. [2] A two-factor, 2x3 repeated measures ANOVA was used to determine age and training effects. The results were:

	YOUNGER			OLDER		
Variables	Mo. 0	Mo. 4	Mo. 8	Mo. 0	Mo. 4	Mo. 8
GEE ($kcal \cdot min^{-1}$)	8.5±1.5	7.2±1.0[b]	7.1±0.9[b]	8.2±1.4	7.6±1.2	6.8±0.8[b]
$\dot{V}O_2$ ($L \cdot min^{-1}$)	1.7±0.4	1.5±0.3[b]	1.5±0.2[b]	1.7±0.4	1.6±0.4	1.4±0.2[b]
RER	.89±.08	.80±.05[b]	.78±.06[b]	.91±.08	.79±.08[b]	.82±.07[b]
Pred. $\dot{V}O_2max$[a] ($ml \cdot kg^{-1} \cdot min^{-1}$)	32±6.4	36±7.8[b]	36±8.1[b]	28±4.9	31±5.4[b]	33±5.8[b]

[a] Significant age group difference across all months ($p<.05$).
[b] Significantly different than month 0 ($p<.05$).

No difference was found in GEE between the age groups, although a reduction in GEE occurred in both groups following endurance training. It was concluded that 30 and 50 year old men expend the same amount of energy at a given submaximal exercise PO, and that the reduction in GEE from endurance training was equal in magnitude between the Y and O groups.

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Saturday, April 9
11:00-11:15 a.m.

EFFECTS OF VARIOUS ACTIVE RECOVERY DURATIONS AND RESULTING BLOOD LACTATE LEVELS ON POWER OUTPUT DURING CONSECUTIVE CYCLE ERGOMETER TESTS.

Barbara E. Ainsworth and Robert C. Serfass, University of Minnesota

The effects of three active recovery durations (AR) and resulting blood lactates (HLa) on power output (PO) of consecutive all-out, high-intensity, cycle ergometer tests were studied in 16 male competitive cyclists ($\bar{X}$ age = 25.4 $\pm$ 5.2 yr; $\bar{X}$ VO_2 max = 67.6 $\pm$ 4.1 ml·kg^{-1}·min^{-1}; $\bar{X}$ body fat = 8.3 $\pm$ 2.5%). After familiarization, subjects completed 3 separate testing sessions of an initial and a subsequent all-out 45 sec, pedalling trial at 5.5 kg of resistance. The trials were separated by randomly assigned 6, 9, or 12 min of AR cycling at 80 rpm and 1 kg resistance (relative intensity = 28.9% VO_2 max, 54% HR max). Power measurements were calculated for 5 sec peak (PPO), 45 sec total (TPO) and percent power decline (PD). Power was determined by computer analysis of ½ flywheel rev·sec^{-1} at 5.5 kg of resistance on a Monarch bicycle ergometer. Twenty-µl of fingertip capillary blood were collected for HLa determination at 5 min after both the initial and subsequent all-out tests, and during the last minute of each AR. Repeated measures ANOVA and appropriate follow-up Tukey's-w tests revealed no significant differences between initial tests for 5 sec PPO ($\bar{X}$ = 771 $\pm$ 77), TPO ($\bar{X}$ = 578.5 $\pm$ 50); PD ($\bar{X}$ = 37 $\pm$ 9.5%), or peak HLa ($\bar{X}$ = 11.2 $\pm$ 1.9 mM/L^{-1}). However, TPO was significantly less ($P<.05$) on the subsequent trial following 6 min of AR ($\bar{X}$ = 551.2 $\pm$ 51) *vs*. 9 min AR ($\bar{X}$ = 575.1 $\pm$ 53) or 12 min ($\bar{X}$ = 581.7 $\pm$ 49.9). Further, PD was significantly less ($P<.05$) following 12 min of AR ($\bar{X}$ = 32.8 $\pm$ 11.6%) *vs*. 6 or 9 min of AR ($\bar{X}$ = 38.1 $\pm$ 9%; 34.6 $\pm$ 11%). There were no differences in PPO ($\bar{X}$ = 702 $\pm$ 95) or peak HLa ($\bar{X}$ = 14.2 $\pm$ 2.5 mM/L^{-1}) between subsequent all-out tests. Pearson correlation analyses revealed that reliabilities between initial tests ranged from r = 0.79 to r = 0.89 for PPO and from r = 0.80 to r = 0.91 for TPO. Correlations between HLa remaining after 6, 9, and 12 min of AR from an initial all-out 45 sec cycling bout and subsequent TPO were significant at r = 0.48, r = 0.59, and r = 0.64 respectively. These data indicate that, in well-trained cyclists, the PPO and TPO tests are highly reproducible and that, specific to the type of AR assigned in this study, the least amount of time required to assure equivalent subsequent PO on all-out 45 sec cycle ergometer tests is between 6 and 9 minutes. Further, recovery HLa resulting from an initial 45 sec PO test is moderately related to subsequent PO.

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Saturday, April 9
11:15-11:30 a.m.

SERUM CREATINE KINASE AND LACTATE DEHYDROGENASE ACTIVITY FOLLOWING A MAXIMAL BOUT OF EXERCISE. W.R. Thompson, H.M. Neisler, K.D. Johnson, J.K. Davis, Laboratory of Applied Physiology, Departments of Physical Education and Medical Technology, University of Southern Mississippi, Hattiesburg, MS 39406-5034

The diagnosis of acute myocardial infarction (MI) is determined from a compatible symptomatic history, characteristic ECG, and serial cardiac-specific enzyme changes. The sensitivity and specificity of cardiac enzymology is further enhanced by the determination of the activity of selective serum isoenzymes of creatine kinase (CK) and lactate dehydrogenase (LDH) whereby the organ responsible for the serum enzyme elevation can be more specifically identified. While those increases in serum levels are known to occur after an acute MI, recent studies confirmed the presence of elevated cardiac enzyme levels, especially CK, in endurance-trained athletes after competition creating a diagnostic dilemma. Because of the clinical correlates to exercise, the purpose of this study was to determine the time course during which total CK, its isoenzymes (CK-MM, CK-MB, CK-BB) and LDH and its isoenzymes (LDH1-5) alter after an acute bout of maximal exercise. A second purpose was to follow the time course of these enzymes after exercise to determine if it is similar to literature documented acute MI. The subjects for this study consisted of 9 caucasian males (aged 30 to 50 years). Venous samples were obtained prior to exercise (A), 30 minutes (B), 8 hours (C), 24 hours (D), and 48 hours (E) post exercise. Total CK and LDH activity were determined spectrophotometrically. Isoenzymes of CK and LDH were separated by electrophoresis, localized by fluorescence, and quantitated by densitometry. Subjects remained inactive during the study. All total CK and LDH values remained in the clinically normal range for each assay period; however, one way ANOVA for repeated measures followed by the Newman-Keuls post hoc comparison procedure indicated a significant elevation ($p<.05$) in CK and CK-MM at C over E. Likewise, significant elevations were found in LDH4 and LDH5 at C over A. All increases could be attributed to two of the subjects who had characteristic LDH1-LDH2 "flips" and increased LDH5 levels characteristic of myocardial damage. Follow-up studies of these subjects indicated no cardiovascular disease. Based upon the findings of this study, the following were inferred: this study has shown that maximal bouts of exercise can elicit significant increases in serum CK and LDH; the increase in CK is due to a rise only in CK-MM; some subjects may demonstrate other enzyme or isoenzyme changes needing additional medical follow-up.

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Saturday, April 9
11:30-11:45 a.m.

THE RELATIONSHIP BETWEEN VO_2 MAX, VENTILATORY THRESHOLD, AND RACING EXPERIENCE OF COMPETITIVE CYCLISTS. Sherrie Evenson, Mark Gardner, Ann Ward, Sharon Wilkie, Patty Freedson, James Rippe, Departments of Exercise Science and Medicine, University of Massachusetts, Worcester, MA 01605.

This investigation examined the relationships between VO_2 max, ventilatory threshold (VT), and racing experience of 15 male local competitive cyclists in peak season (age =18-40 yrs; X $\pm$ SD age, Ht, Wt=23.9$\pm$5.3 yrs, 178.3$\pm$8.2cm and 71.3$\pm$3.7kg). A racing history was completed by each subject, revealing a mean ($\pm$SD) cycling distance of 213.3$\pm$69.4 mi/wk in peak season. Cyclists had been training regularly an average of 3.9$\pm$1.2 yrs and racing competitively for 3.4$\pm$1.4 yrs. Average racing speed was 24.7$\pm$2.6 mph. Percent fat was estimated from skinfold measurements. VO_2max was determined by a graded test to volitional exhaustion on a cycle ergometer. VT was identified by 2 independent investigators as the first nonlinear break in VE/VO_2, without a corresponding break in VE/VCO_2 (r=0.91 between investigators). Average values for VT were used for subsequent analysis. Physiological results are (X+SD):

	VO_2max (ml/kg/min)	VO_2 max (L/min)	VT (L/min)	VT (%VO_2)	%Fat
x	68.4	4.85	3.28	67.6	6.2
S.D.	4.6	.40	0.42		2.3

Pearson product-moment correlations resulted in significant relationships between VO_2 max (L/min) and both number of years racing (r=0.61, SEE=.33, $p < .05$) and racing speed (r=0.66 SEE=.30, $p < .05$). VT showed a similar relationship with number years racing (r=0.56 SEE=.36, $p < .05$) but a nonsignificant correlation with racing speed (r=0.34, SEE=.42). VO_2 max (L/min) correlated higher with all race history variables than did VO_2 max expressed in relative terms (ml/kg/min). Conclusion: in cycling, a high VO_2 max, high VT in L/min, and racing experience contribute to race performance.

Supported by a grant from Life Fitness

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Saturday, April 9
11:45-12:00 noon

PRE- AND POST-EXERCISE BLOOD PRESSURES OF OBESE AND NON-OBESE 5&6 YEAR OLD CHILDREN. K.A. Greaves, J. Puhl, & T. Baranowski, Univ. of Texas Medical Branch, Galveston, Texas.

A strong positive relationship has been documented between obesity and resting blood pressure (BP) in both adults and children. The BP response of children to exercise has not been so clearly delineated. The present study determined the recovery BP response to a progressive maximal treadmill test in 12 obese (O) and 22 non-obese (NO) 5-6 year old children. The exercise test consisted of four 3 min. steady state stages followed by a continuation to maximal exertion. Systolic (SBP) and diastolic (DBP) BP's, heart rates (HR), and mean arterial pressures were recorded before exercise (PRE), immediately after exercise (IMM), and 11, 26, 41, and 56 MIN into the recovery period. All children were seated during the BP and HR determinations and their activity was limited during the 60 min. of recovery. ANOVA ($p<0.05$) was used to evaluate the differences across groups. There were no significant differences between the O and NO groups in PRE and recovery BP's. There were also no significant gender differences in these variables. The IMM were significantly higher than the PRE for all groups. All of the recovery BP's, with the exception of IMM, were not significantly different from the PRE, with the exception of the SBP and DBP 11 MIN of the obese girls. This is evidence for a slower BP recovery from maximal exercise among obese girls than lean girls. Among boys, obesity status did not appear to make a difference. The differences in BP response to recovery from maximal exercise in O and NO children which had been documented in other research may not become evident until later in life, or may take less than 11 minutes.

Table 1. Pre- and Post-exercise BP's of Obese and Non-obese Boys (B) and Girls (G).

	PRE	IMM	11 MIN
SBP			
O-B	109.7±4.0	129.6±12.4 *	115.8± 7.3
O-G	105.9±5.8°	128.6±18.5 *	117.1±13.9°
NO-B	107.5±7.8	132.3±13.1 *	110.7± 6.9
NO-G	106.0±6.0	133.9±10.2 *	108.9± 9.0
DBP			
O-B	64.8±4.6	80.8± 9.9 *	70.8± 7.6
O-G	65.4±6.3°	76.3± 7.5 *	71.6±10.9°
NO-B	68.2±7.1	86.2±10.3 *	69.3± 5.9
NO-G	64.2±4.3	80.0±11.4 *	65.4± 4.8

Supported by NHLBI Grant #5R01 HL35131.

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Saturday, April 9
12:00-12:15 p.m.

Reliability and Within-Subject Variability of Peak Torque and Peak Torque Repetition Number.

M. Daniel Becque, Sheilah Brodsky, Charles Marks, Karen Nau, Victor Katch. Applied Physiology Laboratory, Department of Kinesiology, The University of Michigan

The purpose of this experiment was to examine the reliability and within-subject variability of peak torque (PT) and peak torque repetition number for hydraulic resistance exercise. Ten subjects completed 10 repetitions on 8 days at 3 different movement speeds for the knee, chest and shoulder joints on a Hydra Fitness Omnitron. The 3 speed settings were Hydra Fitness #10 (slow), #6 (medium) and #3 (fast). The 9 joint and speed combinations were presented randomly. For the 3 segments, the slowest speed always produced the greatest PTs for both flexion and extension. The highest PTs were found for the chest (594.0±144.4 N), followed by the shoulder (310.7±109.8 N) and the knee (106.8±25.5 N). Within-subject variability of PT (S_WPT) was calculated as the average standard deviation for each individual about their own mean and exhibited the same trend as PT. S_WPT for both flexion and extension ranged from ±3.5 to ±8.2 N for the knee, from ±15.5 to ±44.6 N for the chest and from ±9.2 to ±32.7 N for the shoulder. Expressed as a percent of the mean PT, S_WPT was remarkably consistent across all of the joint, speed and direction combinations and averaged ±9.4%. The reliability of PT ranged from r = 0.79 to 0.96. The average PT repetition number ranged from 2 to 4 for all conditions. Within-subject variability for PT repetition number (S_WRN) was highest at the slow movement speeds and lowest at the fast movement speeds for the knee, chest and shoulder. S_WRN ranged from ±0.7 to ±2.7 repetitions. Expressed relative to the mean, S_WRN ranged from ±37.9 to ±96.1%. The reliability of the PT repetition number was low ranging from r = 0.04 to 0.40. In conclusion, PT for hydraulic resistance exercise was very reliable. Expressed relative to the mean, within-subject variability for PT was surprisingly uniform between joint, speed and direction combinations, averaging ±9.4%. Individual differences for PT repetition were low due to large within-subject variability. PT occurred 95% of the time between the second and fifth repetition.

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Saturday, April 9
2:00-2:15 p.m.

BETA-ADRENERGIC BLOCKADE AND SKELETAL MUSCLE CONTRACTILE PERFORMANCE. Stephen F. Crouse, Texas A&M University; Toshio Moritani, Kyoto University, Japan; James Sterling, Texas A&M University.

It has been postulated that the decrement in physical performance and fatigue associated with beta-adrenergic blockade (BB) may have peripheral as well as central components. To investigate this hypothesis with respect to direct effects on muscle contractile characteristics, 7 healthy, drug-free men performed biceps brachii exercise under both BB (80 mg propranolol hydrochloride) or placebo (citrate) conditions (random order, double blind). Maximum voluntary isometric contraction (MVC) was assessed at a joint angle of 120 degrees of flexion. To determine the force-velocity characteristics of the muscle under each experimental condition, the velocity of a concentric biceps contraction was assessed at four different forces of resistance (.23, 2.3, 9.1, and 13.6 kg) applied in random sequence with a 1 minute recovery period between each maximal effort; maximum velocity (VEL), peak power (POW) achieved, and percentage of MVC at which POW (%MVC) occurred were subsequently determined. Data were analyzed using a one way repeated measures MANOVA with 4 dependent measures; the effects due to condition were not significant. Results are reported as means:

	VARIABLE			
CONDITION	POW (w)	MVC (kg)	%MVC (%)	VEL(m/s)
Beta-blockade	256.6	65.2	37.3	6.17
	(59.5)	(18.6)	(5.8)	(.49)
Placebo	257.7	68.5	36.9	6.12
	(73.9)	(18.0)	(5.2)	(.54)

These data indicate that acute ingestion of a nonspecific beta-adrenergic blocking agent does not impair maximal static strength, peak power production, or maximal velocity of muscular contraction in healthy men. Thus, performance of tasks requiring short bursts of near maximal muscular effort with substantial recovery time between efforts should not be unduly affected by BB.

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Saturday, April 9
2:15-2:30 p.m.

The Relationship Between Anaerobic Capacity from the "Wingate" Test and Anaerobic Work Capacity from the Critical Power Test. L Nebelsick-Gullett, TJ Housh, and GO Johnson. Center for Youth Fitness and Sports Research, University of Nebraska-Lincoln.

It has been theorized that the Critical Power (CP) Test provides information regarding the maximal rate of fatigueless work and a measure of anaerobic work capacity (AWC). Previous research has reported a significant relationship between CP and ventilatory threshold however AWC has not been validated against a criterion measure of anaerobic capabilities. In addition, the reliability of AWC and CP have not been established. Therefore the purpose of this study was twofold: (1) to determine the relationship between AWC and anaerobic capacity (AC) from the "Wingate" test; and (2) to determine the reliability of AWC and CP. Twenty-five females (X age $\pm$ SD = 21.88 $\pm$ 2.49 yrs) volunteered to perform a "Wingate" test and two Critical Power tests on separate days with the order of testing randomized. The "Wingate" protocol included a 30-second maximal effort on a Monarch bicycle ergometer with the resistance set of 0.075 x body weight in kilograms. The "Wingate" test has been shown to be highly reliable therefore only one test was performed. The Critical Power test consisted of pedaling a Monarch ergometer at three different workloads until the subject could no longer maintain an 80 rpm cadence. Exhaustion was considered to occur at 75 rpm. The relationship between work limit (total amount of work performed at each workload) and time limit (total time to exhaustion at each workload) for each subject was found to be highly linear (r^2 = 0.98 - 1.00). The slope and Y intercept of the work limit-time limit relationship represent CP and AWC respectively. Student's t-tests showed that there were no significant ($p > 0.05$) differences between the test-retest means for CP or AWC (CP test X $\pm$ SEM = 156.56 $\pm$ 6.82 watts, CP retest = 157.94 $\pm$ 7.65; AWC test = 9614.36 $\pm$ 546.98 joules; AWC retest = 10,083.04 $\pm$ 584.69). Test-retest correlations and standard error of estimates for CP and AWC were $r = 0.94$, ($p < 0.00005$), SEE = 12.34 watts and $r = 0.87$ ($p < 0.0001$) SEE = 1358.44 joules respectively. The correlation between AC (X $\pm$ SD = 438.02 $\pm$ 61.42 watts) and AWC was $r = 0.74$ ($p < 0.0005$) with a SEE = 42.08 watts (9.6% of the X of AC). When considered in conjunction with previous investigations, the results of this study indicate that the Critical Power test is a valid and reliable technique for determining anaerobic capabilities as well as the maxmial rate of fatigueless work.

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Saturday, April 9
2:30-2:45 p.m.

SPINAL, FEMORAL, AND RADIAL BONE MINERAL INDEX AND BODY COMPOSITION IN 100 FEMALES, AGED 35-72 YEARS. A.J. Hugghins, B.C. McKeown, J.E. Ballard, and S.A. Zinkgraf; The University of Texas at Tyler.

The development of osteoporosis is associated with genetic, nutritional, hormonal, environmental, physical and morphological factors. The natural aging process involves changes in body composition (BC), i.e. increases in % fat and decreases in body density (BD), fat free weight (FFW), bone mineral content (BMC), and seems to predispose females to an increased risk of bone fracture. Since the literature for dual photon absorptiometry is very limited, there are no known available norms at the femoral or lumbar sites. Consequently, it is the purpose of this study to describe changes in BC variables (anthropometric, densiometric, and bone density) in a cross-sectional sample of 100 women, aged 35-72 years. BD was evaluated by hydrostatic weighing with residual volume measured by the nitrogen wash-out technique. BMC was measured at two sites with a single photon Norland Bone Densitometer (1/3 distal and 4 mm distal) and four sites with a dual photon Lunar DP3 Densitometer (Femoral Neck, Ward's Triangle, Trochanteric, Lumbar 2-4). Mean morphological values for the composite group were as follows: Age=54.6±9.3 yrs; ht=163.7±5.7 cm; wt=61.9±9.1 kg; BD=1.023±.014 g/cc; BF=32.5±6.1%; FW=20.4±6.2 kg and FFW=41.4±4.9 kg. A subsequent analysis by age with 10 year increments (35-44, n=20; 45-54, n=29; 55-64, n=37; 65-72, n=14) revealed decreasing values for BD and FFW with increasing % BF and FW. Bone Mineral Index (BMI, g/cm^2=BMC/BW) values were as follows: 1) 1/3 distal =.675±.080; 2) 4 mm distal=.374±.069; 3) Femoral Neck=.785±.121; 4) Ward's Triangle=.650±.141; 5) Trochanteric =.655±.106 and 6) Lumbar 2-4 =1.114±.158 g/cm^2 . Inspection of BMI across 4 age groups revealed decreasing values for each variable:

Single Photon(g/cm^2)	35-44	45-54	55-64	65-72
1/3 distal radius	.736±.048	.695±.072	.655±.076	.598±.066
4 mm distal radius	.406±.040	.398±.069	.358±.069	.319±.055
Dual Photon				
Femoral Neck	.863±.085	.796±.131	.759±.107	.719±.124
Ward's Triangle	.762±.101	.664±.173	.605±.107	.581±.098
Trochanteric	.704±.067	.661±.131	.644±.085	.602±.119
Lumbar 2-4	1.232±.089	1.131±.161	1.081±.156	.998±.124

The data indicate a progressive bone loss in these Ss across 4 decades with bone loss reaching fracture risk levels at approximately 65 years of age. Consequently, women of all ages need to be cognizant of BMI decline, fracture risk levels and intervention programs designed to reduce the rate of bone loss.

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Saturday, April 9
2:45-3:00 p.m.

BODY COMPOSITION AND RESTING ENERGY EXPENDITURE IN LONG-TERM PARAPLEGIA. Darlene A. Sedlock, Stephane J. Laventure, Christopher L. Melby, Donald L. Corrigan, Purdue University

Obesity is a major health problem for many wheelchair dependent (WD) individuals. It has been suggested that disuse atrophy of the lower limbs experienced by WD may have substantial implications for weight regulation, since lean body mass (LBM) has been shown to be the best singular predictor of resting energy expenditure. The purposes of this study were 1) to examine the body composition and resting metabolic rate (RMR) in a group of WD and 2) to investigate the relationship between RMR and LBM in this group. Subjects were four male paraplegics (X $\pm$ SEM age, height and weight = 27.5 $\pm$ 2.3 yr, 180.5 $\pm$ 2.5 cm and 73.3 $\pm$ 4.9 kg, respectively) with a spinal cord lesion between T4-L1, and 7.4 $\pm$ 3.3 yr of disability. Body density was determined by hydrostatic weighing and converted to %fat using the Siri equation. Residual volume was measured using an oxygen dilution technique. A ventilated hood system was used to measure RMR in a supine position after a 12 hr fast. Results of the body composition analysis were: body density = 1.047 $\pm$ .006 gm/cc, %fat = 23.0 $\pm$ 2.7, and LBM = 56.3 $\pm$ 3.5 kg. RMR was 1.06 $\pm$ 0.11 Kcal/min or 1.14 $\pm$ 0.05 Kcal/kg LBM/hr, which was not significantly different ($p > .05$) from a group of able-bodied men (1.12 $\pm$ 0.07 Kcal/min, 1.20 $\pm$ 0.07 Kcal/kg LBM/hr) with similar body composition characteristics (55.8 $\pm$ 2.5 kg LBM, 21.3 $\pm$ 2.8% fat). RMR and LBM were significantly correlated in the WD ($r = 0.98$, $p < .05$). Results indicate that the body composition of the WD was within the expected range for males of their age group, and that RMR was similar to a group of able-bodied men who were matched for body composition. Additionally, the relationship between RMR and LBM in this sample was similar to that which has been previously observed in the able-bodied male population. This study demonstrates that factors other than RMR, e.g. level of physical activity, may be more important regarding weight regulation in individuals with long-term paraplegia.

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Saturday, April 9
3:00-3:15 p.m.

ANALYSIS OF COLORECTAL CANCER SCREENING PARTICIPATION THROUGH ASSESSMENT OF THE THEORY OF REASONED ACTION. Emogene Fox, University of Central Arkansas.

The purpose of this study was to utilize the Theory of Reasoned Action (sometimes called Fishbein's Model) to predict and explain participation in colorectal cancer screening. Two groups, categorized participants and non-participants, were compared for differences on each of the two basic components of the theory: (1) attitude toward the behavior and (2) subjective norm. The study population consisted of 339 persons, 21 years of age or older, that were randomly selected from a data base of 121,306 persons who had requested screening kits from a local hospital. A survey instrument, designed to operationalize components of the reasoned action theory, was mailed to collect the data. Wilks' Lambda (U-statistic) and univariate F-ratio used to test each of the two components of the model, by group membership, revealed no significant differences existed when comparing participants and non-participants on the attitudinal component. Significant differences were found when comparing the two groups on the normative component. Stepwise discriminate analysis, designed to reduce Wilks' Lambda to the minimum level, identified discriminate predictor variables. These variables were applied to the data and group membership was predicted. Since group membership was known, predicted membership was compared with known membership. For the total sample population, participant membership was predicted at 70.8% accuracy while non-participants were predicted at 64.6% accuracy. Six discriminate predictor variables were identified for the total sample. When controlling for gender, seven discriminate predictor variables were identified for males and four predictor variables were identified for females. These predictor variables were different when comparing the total sample, males only and females only. Implications of the study include the following. (1) Other studies utilizing the theory of reasoned action to predict health behaviors have found the attitudinal component to be the most significant predictor of behavior. This study found the normative component to be the stronger predictor of behavior. (2) Study results indicate that males and females participate in colorectal cancer screening for different reasons. Therefore, mass screening programs should be targeted toward specific populations. (3) Colorectal cancer educational and screening efforts should be targeted toward specific predictor variables, unique to either males or females.

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Saturday, April 9
3:45-4:00 p.m.

A PATH ANALYTIC MODEL FOR INVESTIGATING THE RELATIONSHIP AMONG STRESS, ILLNESS, SOCIAL SUPPORT AND HEALTH PRACTICES, Doris A. Abood Florida State University.

Health educators are increasingly concerned with the health consequences of stress and with what can be done to mitigate adverse effects. This study examines the effects of stress, health practices and social support on illness, along with those of certain demographic variables, using data obtained from employees of two major engineering firms. Using the Alameda County items to measure health practices and social network, as well as measure of stressful life events, illness occurrence and standard demographic variables, this study utilized multiple regression analyses to specify the paths by which social support, health practices and demographic variables act independently on illness. Path analyses revealed that among the endogenous variables, stressful life events had the strongest direct effect on illness--the more life events reported the greater the number of illnesses. Health practices and social support also had statistically significant direct effects on illness--the more positive health practices engaged in and the greater social support available, the fewer the illnesses. Only age and sex had a significant direct effect on illness, with older people and females experiencing more illness. With respect to indirect effects, stressful life events had a positive indirect effect on illness level through health practices. As for exogenous variables, individuals with higher income had greater social support, older people had fewer life change events and more educated people had more positive health practices. These analyses confirmed the stress/illness relationship and the need for health education interventions to assist individuals in dealing effectively with the adverse effects of stress.

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Saturday, April 9
4:00-4:15 p.m.

A RURAL COMMUNITY ORGANIZED PEER FACILITATED SENIOR CITIZENS HEALTH PROMOTION PROGRAM. Mary Sutherland and Marie Cowart, Florida State University and; Carol Wortham, HRS District II Area Agency on Aging.

This study utilizing the CDC HAPPS planning model and the locality development community organization strategy was designed to reduce hypertension as related to the potential contributing factors of exercise, weight, blood pressure measurement, medication compliance, and nutritional practices. Most importantly, principles of self-responsibility for personal and community health practices were incorporated into the $6000 HRS funded senior citizens project. The project was implemented with the assistance of two senior citizen peers facilitators and an active community advisory council consisting of community decision makers and program participants. The advisory council was responsible for determining program direction e.g. monthly themes and suggesting and obtaining the necessary "people" resources. Additionally, the advisory council solved project problems, e.g., having the community center repainted, locating a TV and VCR to use with an exercise video, and obtaining legislative support for the program. Program intervention activities included a three-times weekly thirty minute exercise program; reinforcing weekly weigh-ins and bi-weekly blood pressure checks; physician referral for anti-hypertensive prescriptions and maintenance; diet instructions; health promotional educational activities, and; most importantly, socialization activities. During the seven month program time period, 1842 individuals participated in 97 different project sessions. Thirty-three educational presentations were given by the senior citizens in such areas as smoking cessation, salt, dental health, calcium, humor, food stamps, advertising, or medicaid. Evaluation activities were based on the measurable HAPPS impact and process objectives. T-tests were used to analyze pre-post weight, blood pressure, and health practices data for the 17 mostly female clients with an age range of 64 to 88. T-values for weight, systolic blood pressure and diastolic blood pressure were 21.02, 2.09, and 11.08 respectively, indicating significance at .05. Three of the four impact objectives and all of the process objectives were achieved. Fourteen individuals lost a total of 89 pounds; six individuals were able to reduce their blood pressure sufficiently to re-enter acceptable medical limits and; program participants are accepting greater responsibility for their health as indicated by significant pre-post measured changes in the medical care system usage, exercise patterns, nutritional eating habits, and positive mental health practices. Finally, during project year 2, all project participants maintained medically acceptable blood pressure readings. Lastly, this project is currently being seriously considered by DHHS for expansion into the black rural churches.

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Saturday, April 9
4:15-4:30 p.m.

THE RELATIONSHIP OF PHYSICAL ACTIVITY AND SMOKING HABITS, BODY FAT, BLOOD PRESSURE, AND AGE WITH EMPLOYEE HEALTH CARE COSTS. Ron A. Ratliff, Vicki L. Cleaver, and Byron G. Goff, University of Oklahoma.

Purpose: The purpose of the study was to determine the relationship of five CHD risk factors with employee health care costs among a representative sample of male employees of a large, self-insured utility company. Methods: Health care costs for two years of 189 male employees, age 30-60 years were compared to their exercise and smoking habits, and to body fat, blood pressure, and age characteristics. A general linear model analysis examined the association of health care costs to the values of these independent variables according to their relative classification as low, moderate or high risk for CHD. Findings: Exercise and smoking were found to have a significant ($p < 0.05$) association with increased health care costs. The analysis further showed employee health care costs increased during the two year period an average of $38 for each cigarette smoked per day, and $600 if the subject was inactive rather than very active. Relative body fat, blood pressure, and age values did not show a significant ($p > 0.05$) relationship with health care costs among employees within this corporation. Conclusions: These data demonstrated that exercise and smoking habits significantly influence employee health care costs in this population, whereas age, relative body fat or blood pressure values do not. Potential implications to corporate health-fitness promotion efforts are to emphasize employee compliance to exercise and no-smoking programs to reduce health care costs.

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Saturday, April 9
4:30-4:45 p.m.

EFFECTS OF A PRESCHOOL HEALTH EDUCATION CURRICULUM ON CHILDREN'S HEALTH KNOWLEDGE. Gary D. Nelson, Center for Disease Control; Charlotte M. Hendricks, University of Alabama at Birmingham; Danise Echols, University of Alabama at Birmingham.

Preschool health education programs represent a relatively recent public health innovation. This study examined the effects of the "Hale and Hardy's Helpful Health Hints" preschool health education curriculum on the health knowledge of children 3-5 years of age residing in the State of Alabama. The data producing sample in this study consisted of nine experimental preschool programs (194 children) and three comparison group programs (73 children). A picture identification test was used to assess a child's pretest and posttest health knowledge of curriculum content including the five seneses, safety, nutrition, dental health, personal responsibility, emotions, hygiene, and drugs/medicines. Inservice training of preschool program teachers and curriculum implementation was completed between the months of October, 1986 and April, 1987. Posttest knowledge scores increased by 22 percent among experimental group preschool programs and 12 percent among comparison group preschool programs. Significant differences ($p < .01$) between pretest and posttest scores were found within experimental and comparison group preschool programs. Significant posttest differences ($p < .01$) between experimental and comparison group subjects were found with the individual as the unit of analysis. Test item analysis further indicated specific content strengths of the curriculum. Statistical and visual analysis of the results indicate the curriculum had a moderate impact on child health knowledge. The findings of this study highlight issues related to preschool program evaluation including naturalistic versus controlled experimental studies, student versus program as the unit of analysis, and norm referenced versus criterion referenced testing. The findings also provide direction in research efforts which attempt to define the conditions in which preschool health education is most effective.

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Saturday, April 9
4:45-5:00 p.m.

SELF-CONTROL, PERCEPTIONS OF INTOXICATION, AND BLOOD ALCOHOL CONCENTRATION IN SOCIAL DRINKING SETTINGS. Chudley E. Werch, University of Arkansas.

Although some authors (Maisto, Connor & Sachs, 1981) have stated that people are perhaps motivated to monitor their intoxication levels to make decisions about further drinking, relatively few studies have examined self-initiated attempts to discriminate levels of intoxication made by nontherapeutic populations. The purpose of this study was to examine the associations among self-control style, discriminability of internal physiological sensations, awareness of external stimuli related to the number of drinks consumed, perceptions of intoxication, and actual blood alcohol concentrations of subjects in social drinking settings. Sex and frequency of alcohol consumption were also examined for potential association with self-control, perceptions of intoxication, and blood alcohol concentration. A total of 156 individuals volunteered to participate in a survey, while walking by preselected drinking establishments. Subjects were selected using a computer generated list of random numbers. An interview schedule was developed and pretested on a group of young adults to eliminate ambiguous items. The resulting 30 item schedule took five minutes or more to administer to each participant in a face-to-face interview. At the conclusion of the interview, subjects were asked to provide a breath sample to determine blood alcohol concentration. The majority of subjects (72%) were found to practice either an internal, external, or a combination of these two common styles of self-control, to make drinking decisions. Using Analysis of Variance tests it was found that those who use common self-control styles are younger male drinkers who are particularly discriminative of the positive and nonaversive effects of alcohol as well as the amount others with them are drinking (all p's $<.05$). This study also found that drinkers can make at least crude estimates of their level of intoxication, and that the accuracy of these estimates decrease as blood alcohol concentration increases. Furthermore, the ability to estimate BAC is not necessarily a function of being attentive to changes in all internal and external cues during drinking. Lastly, this study found that both sex and the frequency of alcohol use are factors which are associated with the perception of intoxication, as well as the awareness of changes in specific internal and external stimuli during drinking.

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Saturday, April 9
5:00-5:15 p.m.

TITLE: The Relationship Between Smokeless Tobacco Use and Cigarette Smoking.

PROBLEM: The problem of this study was to identify the relationship between smokeless tobacco use and cigarette smoking by high school seniors. Inadequate data are available regarding the relationship between smokeless tobacco use and cigarette smoking. It is not clear regarding the sequence of use between these products; i.e., do subjects initiate their tobacco product use with cigarettes or smokeless tobacco. Further, clarification of existing relationships between use of these two tobacco products could provide important information for the development of effective prevention and cessation strategies to reduce this nation's number one cause of morbidity and mortality: consumption of tobacco.

PROCEDURES: A questionnaire was developed by the investigator, reviewed by a jury of specialists, field tested, and administered to a representative sample of 1,830 high school seniors in the State of New York. Data analysis included descriptive statistics and the chi-square test of association and the chi-square goodness of fit test. The statistical level of significance was set a priori at the .05 level, while the Phi-coefficient was used to measure the practical significance of the findings.

SUMMARY OF FINDINGS: The prevalence of smokeless tobacco use was 6.6 percent. More subjects had experimented with cigarettes (62 percent) than smokeless tobacco (32 percent). Subjects initiated the use of cigarettes prior to smokeless tobacco. It was also interesting to note that 35 percent of the users of chewing tobacco were also concomitantly smoking cigarettes. Results for future intention to use tobacco products found that regardless of the form of tobacco usage, more students reported a greater propensity to use cigarettes in the future than smokeless tobacco. Finally, these findings have direct implications to health education program development. If programs can be developed to prevent cigarette smoking, we may also prevent the onset of smokeless tobacco use.

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Saturday, April 9
5:15-5:30 p.m.

SECULAR TREND IN THE MOTOR PERFORMANCE OF CHILDREN AND YOUTH. John L. Haubenstricker, Vern D. Seefeldt, Crystal F. Branta and Sharon A. Evans, Michigan State University, East Lansing, MI.

The purpose of this study was to determine the existence, if any, of a secular trend in the motor performance of boys and girls during the past two decades. Motor performance measures of children 6 (n=95) and 9 (n=110) years of age obtained in 1968-70 were compared to those of similar-aged children obtained in 1980-82 (n=101 and 105, respectively). Similar data gathered from 14-year-olds (n=68) in 1972-74 were compared to those obtained in 1982-84 (n=73). The measures included a flexed arm hang (FAH), vertical jump (VJ), 30-yard dash (TYD), standing long jump (SLJ), agility shuttle run (ASR), sit and reach (SR) and long shuttle run (LSR). Separate 2 x 2 (group by gender) MANOVA's with the motor performance scores as dependent variables were run for each age. Follow-up discriminant function analyses were used and classification results were obtained for the significant sources of variation. The results showed significant group effects at each age ($p<.001$). Significant gender effects were also obtained at each age: 6 ($p<.005$), 9 ($p.<.002$), and 14 ($p.<.001$). None of the group by gender interactions were significant. Discriminant function analysis for the 6-year-olds revealed that the improved performance in 1980-82 was primarily accounted for by the SLJ, SR and LSR scores, whereas the secular trend for 9-year-olds resulted from performance on the SLJ, ASR, JR, TYD and FAH. For the 14-year-olds, JR, LSR, ASR, SLJ and SR, scores contributed most to the secular trend in performance. Gender differences at age 6 were influenced most by the ASR, SR and TYD scores; at age 9 by SR and LSR performance; and, at age 14 by the SR, SLJ and ASR scores. The girls were more flexible than the boys at all ages in each time period. On other tasks, girls generally performed better than boys at age 6, whereas, boys performed better at age 14. Classification results indicated that about 55% of the 6-year-old, 52% of the 9-year-old and 59% of the 14-year-old children could be correctly classified into their respective secular/gender groups on the basis of their performance. The secular trend (group) effect was more powerful than the gender effect at age 6 (eigenvalues = .493 and .141, respectively) and at age 9 (eigenvalue = .705 and .132, respectively). However, gender was the more potent variable at age 14 (eigenvalues = .849 and .266). The results of this study showed a secular trend in motor performance across 12-year time spans for 6, 9, and 14-year-old children. The cause(s) for this trend require further investigation.

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Sunday, April 10
9:15-9:30 a.m.

IDENTIFICATION OF GENDER SIMILARITIES AND DIFFERENCES AMONG ELEMENTARY SCHOOL CHILDREN USING A STUNT MOVEMENT CONFIDENCE INVENTORY. Michael E. Crawford, University of Missouri; Norma Sue Griffin, University of Nebraska.

The purpose of this study was to describe gender similarities and differences among upper elementary school children (N=356) in response to a stunt movement confidence inventory (SMCI). The SMCI was created as part of an on-going line of test development research designed to validate a model for movement confidence (Griffin & Keogh, 1982). The SMCI was constructed after a similar playground movement confidence inventory (PMCI) failed to identify large numbers of children who were low in confidence and experience. The long term goal of this research is to develop a validated and reliable evaluation protocol to screen for children at risk of injury while engaged in common play and movement behaviors. Multiple discriminant analyses and analytical crossvalidation were used to determine an index of discriminatory power, stability of the SMCI and a validity coefficient. Reliability and Factor analysis techniques were employed to confirm the scale's psychometric properties. Interaction of the movement confidence model components of harm, enjoyment, and competence were analyzed across high/low experience and confidence cells in determining gender differences. Results included acceptable reliability coefficients for item, subscale, total scale and subject stability (r=.79 to .93), a factor matrix which accounted for 50% of total variance and significant discriminant functions ($p<.001$) which classified 88% of all subjects successfully (52.3% improvement over chance). The analysis for gender similarities and differences yielded; (1) large numbers of both sexes low in experience/confidence for common skating tasks, and (2) significant differences ($p<.001$) between sexes for high risk and strength tasks. The SMCI like the PMCI identified complex and shifting perceptions of children in analyzing movement tasks. Specific response profiles of low/high confidence groups add to the evidence of the separability, identity and operation of the movement confidence models components and represent a significant step toward the validation and elaboration of the model. The differences between PMCI and SMCI results however suggest greater environmental and task specificity interactions with the model's components than previously anticipated. Further analysis of body versus object oriented movement behaviors warrant attention in future validation studies.

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Sunday, April 10
9:30-9:45 a.m.

EFFECTS OF OCCURRENCE AND TIME UNCERTAINTY ON REACTION AND MOVEMENT TIMES OF ELEMENTARY AGED CHILDREN. John C. Ozmun, Paul R. Surburg, Fran E. Clelend, Indiana University.

The effects of occurrence uncertainty (catch-trials) and time uncertainty (foreperiod variation) on reaction time (RT) and movement time (MT) provide insights into certain aspects of the psychomotor processing such as anticipation and preparation. The combined effects of these conditions has yet to be examined with children of different ages. Such an investigation could provide information regarding developmental differences in motor performance. This study investigated the influence of catch-trial (CT) occurrence and foreperiod variation on RT and MT of children within first, third, and fifth grade age groups. Forty-eight children (16 per grade) were randomly assigned to either a CT group (30% CTs) or a no catch-trial group. There were an equal number of females and males in all groups. Subjects performed a forward motion from one key to another in response to a visual stimulus. All subjects received randomly presented foreperiods of 1.5, 3.0 and 4.5 seconds. Data were collected from four days of testing, twenty-one trials per day. A five way analysis of variance (groups x gender x grades x days x fore-periods) was conducted for both RT and MT. Results of the RT analysis were significant main effects for gender, grades, days and foreperiods. Significant interactions of days x foreperiods, groups x days x foreperiods and gender x grades x days x foreperiods were also found. Significant main effects for MT were gender, grades, days and foreperiods with interactions of gender x groups x days and groups x days x foreperiods. Results of post hoc analyses of the interactions were that some variations existed between gender and among grades regarding foreperiod effect; generally a 1.5 second foreperiod elicited the slowest RTs and MTs. While there were differences among foreperiods, CT use adversely affected RT and MT performance after the second day of testing. In conclusion, time uncertainty generally affected the performance of a motor task under most circumstances; after a certain amount of testing occurrence uncertainty influenced task performance. No specific age group varied to any extent from these findings.

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Sunday, April 10
9:45-10:00 a.m.

Developmental and biomechanical descriptions of adult beginner swimmers. Balan, C. & Langendorfer, S. P.E.R.D., Kent State University, Kent, OH 44242.

Biomechanical characteristics of elite swimmers are common in the literature (Councilman, 1981; Maglisho, 1983; Schliehauf, 1986). Only recently have developmental biomechanical descriptions of non-elite swimmers such as children appeared (Erbaugh, 1980; Langendorfer, 1987). This study described several developmental and biomechanical characteristics (including arm and leg actions and body position) of 27 adult swimmers enrolled in several University beginning swimming classes. Subject ages ranged mainly from 18 to 22 year, although 6 subjects were over 60 years of age. Swimmers were videotaped from an underwater sideview perspective using a 1/2" VHS-format Panasonic Minicamera and a filming periscope. Using slowed- and stopped-playback modes on a Panasonic videotape, aquatic movements of the swimmers were classified according to developmental status using Langendorfer's Aquatic Readiness Assessment (ARA) instrument (1987). This instrument has reported adequate levels of developmental validity, reliability, and rater objectivity. From a developmental perspective, the adult swimmers in the sample were classified predominantly as rudimentary or intermediate on arm action, leg action, and body position. 15% of the adults used rudimentary patterns of arm movements; 46% used rudimentary leg patterns; and 7% used primitive body positions when swimming in a prone position. Except for young children with the most primitive patterns, the movement patterns of most adult beginners were comparable to the developmental status of those used by children in a previous study (Langendorfer, 1987). The results indicate a need to reexamine methods used to teach adult beginners. In particular, studies to compare specific methodologies such as individualized, developmental procedures and traditional techniques were suggested.

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Sunday, April 10
10:00-10:15 a.m.

DEVELOPMENT OF AN INSTRUMENT TO ASSESS CURRICULAR CONTENT IN ELEMENTARY PHYSICAL EDUCATION. Lynda E. Randall, Bassam Mismar, Steven Pugh, Francisco Alvarez, and Paula Smith; Florida State University.

This study established the validity and reliability of a systematic observation instrument designed for coding curricular content in elementary physical education. In developing the instrument, a lengthy list of categories, definitions, and examples thought to be inclusive of the curricular content in elementary physical education was generated. A judgemental check of content validity, based on the expert opinion of 9 elementary curriculum authorities, was used to validate the instrument. Responses obtained from the experts were used to ensure that the proposed content categories were exhaustive and mutually exclusive, and minor modifications were subsequently made. The resultant instrument (Curricular Assessment System) was designed to observe the behavior of randomly-selected target students in order to obtain data related to the curricular content - i.e., "What do children actually do in elementary physical education? What is the nature of the context of activities in which they engage (Divergent Practice, Convergent Practice, Cognitive Context, Affective Context, or General Context)? What is the specific nature of content within those contexts (e.g. practicing fundamental motor skills, discussing movement concepts, focusing on cooperation, or waiting)?" In order to determine the reliability of the instrument, a total of 30 elementary physical education classes was videotaped. Data were coded from the videotape by two observers who had attained proficiency in its use. Interobserver agreement scores obtained for 10 of the classes demonstrated that the instrument was objective and that the coders were consistent in their use of it. The average reliability obtained for the Context Level was .92, while an average reliability coefficient of .84 was calculated for the Content Level. Descriptive data for the curricular context categories revealed that 54.5% of the observed student behaviors were related to general (non-instructional) contexts. Waiting comprised the most prevalent activity within the General Context, with 31.4% of total student behaviors coded in this category. Motor-Engaged Content was observed for approximately one-third (29%) of the total intervals. A small amount of time (15.9%) was observed in the Cognitive Context, and attention to Affective Contexts was virtually non-existent (.6%). Use of this system could enable researchers to obtain accurate and objective descriptions of curricular content.

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Sunday, April 10
10:45-11:00 a.m.

INFLUENCE OF TEACHER VALUE ORIENTATIONS ON CURRICULUM PLANNING WITHIN THE PARAMETERS OF A CURRICULUM FRAMEWORK. Catherine D. Ennis, University of Wisconsin-Madison.

In curriculum decision-making, content selections are frequently based on educational beliefs or value orientations. Jewett and Bain (1985) have hypothesized that educators with a well defined and explicit value orientation make curricular and instructional decisions consistent with that orientation. It was the purpose of this study to examine the influence of value orientations on teachers' planning using a physical education curriculum framework. The research was conducted cooperatively with a school district to examine the implementation of a new curriculum based on the Logsdon et al. (1984) approach to elementary physical education. The school district sponsored seven workshops to introduce teachers to three components of the curriculum approach (terminology, shared decision-making and cognitive involvement) and to increase teachers' abilities to incorporate these components in their lesson planning. Teachers completed a standard lesson plan form divided into three tasks. Lesson plan data were collected during the first and seventh inservice sessions. Evidence of the use of the components were analyzed by two raters based on typologies of each component (interrater reliabilities ranged from 1.0 to .80). Scores on the Educational Value Orientation Inventory were used to classify the 25 elementary physical educators as either demonstrating or not demonstrating each of the five value orientations. Data were analyzed using three univariate ANOVAs with a .05 alpha level adjusted to produce an experimentwise error rate of $p<.017$. The BMDP2V program (1 between and 2 within design) was used to compute the ANOVAs. Results indicated that teachers with social reconstruction and non-disciplinary mastery orientations made significant gains in use of terminology and shared decision-making. Although value orientation was not significantly related to changes in cognitive involvement, cognitive scores for teachers in all value orientation categories changed significantly during the inservice. Prior to the inservice, teachers included the cognitive component as the second task in the lesson. At the completion of the inservice, it was included as the first and third tasks, thus focusing student attention on cognitive understanding at the beginning and then reiterating this emphasis as the final task. Results of this study suggest that components such as terminology and shared decision-making may be value-related while others such as cognitive involvement are considered important to all teachers regardless of their value perspective.

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Sunday, April 10
11:00-11:15 a.m.

CLASS ORGANIZATION AND TIME USE: THE RELATIONSHIP TO STUDENT ACHIEVEMENT

Stephen Silverman, Lea Ann Tyson, and Linda Marrs Morford,
The University of Texas at Austin

The purpose of this study was to examine the relationships between class organization, time, and student achievement in school physical education. Of particular interest was the often discussed, but never verified, relationship between practice time and type and achievement. Teachers of ten classes and their 202 middle school/junior high school students with complete data were the subjects for the study. Students were pretested and posttested on the volleyball forearm pass and serve using previously validated tests. Between the two testing sessions students received seven days of instruction in these skills which were videotaped using a two-camera split screen system so that virtually all activity in the gym could be identified later. Digitally displayed running time was superimposed on the video image. Student achievement for each class was determined separately for each skill by regressing posttest on pretest and calculating a residual score for every student. The mean of the residual scores for each class was calculated and used in subsequent analysis. An observation instrument was developed and validated for collecting data for time spent in class which included, along with other categories and subcategories, the following: explanation; demonstration; explanation and demonstration; fitness; non-content related categories; and a variety of categories related to practice including how practice was organized and quality of and whether or not the teacher provided feedback. Mean residual achievement was correlated with time spent in the various organization categories. For both skills, total time spent in practice with teacher feedback had a significant, strong, positive correlation with student achievement. When subcategories of practice were considered, individual student practice was positively correlated with achievement and the use of scrimmage for practice had a negative correlation with achievement in situations where it was used for skill practice. Other significant and theoretically meaningful correlations were revealed. This study provides a powerful empirical validation of various aspects of the relationships between class organization, time, and achievement in physical education.

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Sunday, April 10
11:15-11:30 a.m.

30

THE EFFECTS OF AUDIO-CUEING ON PROXIMITY TO STUDENTS OF AN ELEMENTARY PHYSICAL EDUCATION TEACHER IN A FIRST GRADE CLASS.

Hans van der Mars & Barbara Cusimano, Exercise & Sport Research Institute, Arizona State University.

Teacher effectiveness research in classrooms has established a relationship between teachers' monitoring patterns and student academic engagement. Part of the monitoring pattern includes the physical relocation of teachers around classrooms, thus resulting in varying degrees of proximity with individual students. Initial longitudinal data of such proximity patterns in elementary physical education showed that teachers on the average spend approx. 18 % of observed intervals in close proximity with an individual student. To date no experimental data are available on the degree to which teachers' relocation behavior can be altered in terms of proximity to students. This research was conducted to study the effects of audio-cueing on proximity patterns of an experienced physical education teacher while teaching a first grade class. The multielement research design (Cooper, Heron & Heward, 1987) was used to intervene on one teacher's proximity with a target student. In this applied behavior analysis (N=1) design different levels of interventions are applied on alternating sessions. The intervention consisted of audiocues provided to the teacher by way of a microcassette recorder (mean rate of 1 per min.). Following an initial baseline phase, a two-level intervention was added that included audio-cues aimed at maintaining close proximity, and audio-cues aimed at maintaining the greatest distance possible between the teacher and target student. To collect proximity data the activity area was divided into nine sectors. Data on teacher proximity to the target student were collected from videotapes of 22 lessons using momentary time sampling (12 sec. intervals). The dependent variable was defined as the percent of intervals where teacher and target student were located in the same sector. For each condition two randomly selected videotapes were coded by an independent observer. Scored-interval agreement percentages for teacher and target student location data across conditions ranged from 83.3% to 100%. Visual inspection of graphic data showed experimental control was established. Compared to baseline conditions, cueing for close proximity produced significantly higher percentages of intervals in the "same sector", whereas, cueing for distant proximity produced significantly lower percentages. Subsequent t-tests ($p<.05$) supported these findings. It was concluded that teacher proximity patterns can be altered by way of audio-cueing. This conclusion is of importance in view of conducting further experimental study of the differential effects of teachers' relocation patterns. Currently, the effects of differential teacher proximity on learner involvement patterns are being studied.

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Sunday, April 10
11:30-11:45 a.m.

SELF-REPORT OF STUDENTS' COGNITIONS AND TIME ON TASK DURING PHYSICAL EDUCATION INSTRUCTION. Genger A. Fahleson, Boise State University.

This study was an attempt to determine whether investigating students' cognitive processes as mediators between teacher behavior and student achievement in physical education would be a useful tool for research in the gymnasium. Recently it has been suggested that it would not prove to be a fruitful line of research. It is the author's contention that understanding how students think about what the teacher does and says can provide a basis for more effective instruction in physical education. The research literature on learning and instruction in physical education mirrors the notion of behavioral science and has overlooked students' cognitive processes during teaching and learning. Behaviorist traditions make it convenient and natural to speak of changes in behavior as learning. However, observed behavior is no more than an outwardly visable sign of cognitive processes that underlie all behavior. A major weakness of the dominant process-product research paradigm according to Doyle (1978) was that it focused only on student behavior and ignored students' unobservable cognitive responses during instruction. Wittrock's (1974) "model of generative learning" predicts that learners tend to generate perceptions and meanings which are consistent with prior experience, as it is stored in long-term memory, and the new stimuli. Accepting this model, one can see how each student brings a variety of aptitudes and attitudes into any learning situation and students will respond differentially to various pedagogical acts. The present study investigated students' reports of attention, understanding, and cognitive processes during physical education instruction. Three classes of seventh grade students (N = 64) were taught an 8-day physical education unit on a novel skill by their regular physical education teacher. Students were videotaped during instruction and interviewed afterward using a variation of the stimulated-recall procedure developed by Peterson, Swing, Stark, & Waas (1984). Students completed a skills test and questionnaires about their attention, understanding, thinking processes, and attitudes toward physical education. Results indicate that students' reports of understanding, and thinking processes were more highly related to skill learning than observers' low inference data collection variables of students' time on task. Findings also indicate that students' skill ability, reported attention, and cognitions mediated the relationship between instructional stimuli and skill performance.

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Sunday, April 10
11:45-12:00 noon

A VIEW OF PHYSICAL EDUCATION: PERCEPTIONS OF FIVE CLASSROOM TEACHERS. Jane I. Brumbaugh.

The purpose of this study was to gain insights into classroom teachers' perceptions of physical education. Five classroom teachers were engaged in a series of semi-structured, open-ended interviews that were tape-recorded. The transcribed interview data were analyzed using the constant comparative analytic method. The interview data suggest that classroom teachers' perceptions of physical education were influenced by the intertwining of numerous factors. Physical education experiences, however, were critical factors influencing how the participants perceived physical education. Preservice educational experiences were characterized by a theme of irrelevance while the in-service educational experiences were found to be relevant. Because of the uncertainty of the purpose of physical education in the elementary school curriculum and the lack of guidelines, the classroom teachers found their roles in teaching physical education to be nebulous. The way classroom teachers approached the teaching of physical education was influenced by (a) students, (b) principals, (c) colleagues, (d) physical education specialists, and (e) parents of students. The daily demands of teaching and the lack of administrative pressure associated with teaching physical education influenced the importance and the low priority that they placed on physical education in relation to other subjects. In this study, the equipment problem proved to be greater than the lack of equipment. With inadequate space to store more equipment and with limited knowledge of what equipment to order and how to repair it, the equipment issue took on a broader meaning. Although time limitations prevented their developing a closer working relationship with the physical education specialists, the classroom teachers expressed an interest in establishing better communications and closer working relationships with them.

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Sunday, April 10
12:00-12:15 p.m.

AN ANALYSIS OF AMERICAN SPORTSWOMEN IN TWO NEGRO NEWSPAPERS FROM 1932-1948: THE PITTSBURGH COURIER AND THE CHICAGO DEFENDER.
Linda D. Williams, The University of North Carolina.

The purpose of this study was to gain greater insight about American sportswomen. This study deviated from the current historical scholarship on sportswomen in terms of both its focus and method. By applying content analysis to two Negro newspapers, the investigator attempted to create a better means of assessing popular attitudes toward sportswomen. Every issue of the Pittsburgh Courier and the Chicago Defender, was analyzed based on four categories: the extent of coverage, the type of coverage, the style of coverage, and the production of the media. Although the coverage was never equivalent to men's, both papers reported women's sporting activities as well as sponsored athletic leagues or tournaments. Slightly more than three-fifths of the issues in the Defender contained some coverage as opposed to less than one-half of the Courier's. Unlike the Pittsburgh paper, the largest number of articles about sportswomen during five consecutive years in the Chicago paper occurred during a non-Olympic period, 1938-1942. The Defender's 1741 bulletins on women's sports more than doubled the Courier's (771), although less than two percent appeared on the front page. Of these items 92% in the Courier and 85% in the Defender occurred on the first and second pages of the sports section. The content in the articles focused on athletic performance and achievement. Less than 10% of all bulletins in either paper contained negative innuendos about women athletes. Each paper included photographs of sportswomen, however, the photos in the Defender (395) more than tripled the Courier's 125. Basketball, tennis, and track and field accounted for slightly less than two-thirds of the summaries in the Chicago paper and over three-fourths of the items published by the Pittsburgh paper. Despite this fact, 9 of the Courier's 13 reports on the front page were on track, while 19 of the 23 items in the Defender were evenly distributed across four sports: golf, tennis, track, and bowling. Nevertheless, articles on track failed to surpass those on all other sports in both publications except during 1948.

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Thursday, April 7
9:00-10:15 a.m.

LEISURE ALONG THE LOWER CAPE FEAR: EIGHTEENTH CENTURY SOUTHEASTERN NORTH CAROLINA LEARNS TO PLAY. P. Graham Hatcher, University of North Carolina at Wilmington.

The purpose of this investigation was to chronicle the evolution of leisure pursuits, specifically play, sport, and amusement, in the Lower Cape Fear Region of North Carolina during the eighteenth century. Due to this area's early settlement and significance, an examination of the leisure pursuits in historical context provides a glimpse into the total character of this region at a time when its distinctive flavor and personality were taking root. Methods utilized included examination of primary sources such as narratives and personal accounts (from 1731), newspapers (from 1764), county court and safety committee records (from 1774), and personal correspondence (from 1786.) Examination of these sources revealed that horse racing, hunting, swimming, billiards, dances and balls, card playing, and various cultural activities constituted an integral facet of social life. As time passed there came into being a gradual popularization of more refined activities, though what was truly popular apparently was a function of one's sex, age, race, and socioeconomic status. Nevertheless, due to the English tradition of sports and games and a climate and geography conducive to year round participation, residents of southeastern North Carolina engaged in formal and informal leisure pursuits that impacted favorably on the quality of life of the participants.

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Thursday, April 7
9:00-10:15 a.m.

ORGANIZED COMMUNITY RECREATION IN CALIFORNIA, 1900-1930. Roberta J. Park, University of California, Berkeley.

In 1978 California's Proposition 13 reduced tax revenues for various local agencies. Among the hardest hit were community and school sports and recreation programs. Californians had once been able to boast of some of the best public recreation in the nation. In 1904 Los Angeles enacted the first provision; San Francisco, Oakland and Berkeley quickly followed. By 1930 twenty cities and towns employed over 1,800 recreational workers; several hundred more were engaged in smaller towns and rural areas. The Playground reported encouraging developments in California as early as 1909. In 1913 Senate Concurrent Resolution 29 called for a comprehensive statewise study and plan. By 1918 California's new State Supervisor of Physical Education Clark W. Hetherington optimistically reported that a "movement [was] in full swing to bring playgrounds under the administrative control of the schools." (This reflected a 1911 recommendation of the N.E.A.) By 1930, however, half of California's larger towns and cities still retained a separate administrative structure for recreation, although cooperation with school authorities in conducting a variety of programs, primarily in sports, was frequent. As private, as well as public, recreation grew, the need for trained professionals increased. It was consistently difficult, however, to secure men and women with adequate credentials. The state teachers' and private colleges offered very few courses. In 1928 the University of Southern California organized a degree program in recreation in its School of Social Welfare; the University of California at Berkeley offered a graduate curriculum in social service that included field work in recreation for those who had completed a major in physical education and hygiene. It remained unclear, however, how best to prepare recreation professionals. Nearly all the best paid positions in the public sphere were held by men. Even Hetherington's Demonstration Play School had little impact; and a degree in physical education--not recreation--was often the road to advancement. This historical study utilized a wide range of primary source documents, including but not limited to: bulletins, brochures, and reports of local recreation departments; publications of State agencies; college catalogues; publications of national organizations; reports of the Y.M.C.A., California Boys Club, Girl Scouts, etc.; special "News of Playgrounds" sections of local newspapers, and other ephemeral material such as handbooks of the Academic Athletic League and Bulletins of the Community Service Recreation League.

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Thursday, April 7
9:00-10:15 a.m.

A PHILOSOPHIC MODEL TO DISCUSS THE RELATIONSHIP OF SPORT TO ART. Inge Sumanik and Sharon K. Stoll, University of Idaho.

The purpose of this paper is to discuss our philosophic model that compares the characteristics of sport with art. Many in sport would doubt the legitmacy of defining sport in artistic terms or even considering that sport could be compared to art. However, many comparable qualities do exist between sport and art even though the desired means and ends may be different. In sport, the desired end is to win; the means to the end are not important as long as the actions are within the rules of the activity. However, the ends of art are a final creative product, while the means to those ends are very important for the artist and viewer. In contrast, many qualities are shared by sport and art, such as criterion for evaluation, government by rules, and subjective viewing. Additionally, artists and sportsmen compete for intrinsic and extrinsic rewards as they learn about self, space, and time. And, art and sport occur with or without an audience, might end when the creating is over, or may be relived in memory or on film. Thus even though the ends may be different, comparable qualities do exist and are both tangible and symbolic, representing human actualities, and realities. This paper summarizes these relationships and visually presents them in a model construct. The paper is accompanied by a performance example of how sport and art can be synonmous.

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Thursday, April 7
9:00-10:15 a.m.

THE INTEGRATIVE QUALITIES OF HUMAN MOVEMENT -- A FOCUS ON HOW MOVEMENT NATURALLY OCCURS. Janet M. Oussaty, Rutgers, The State University of New Jersey.

The human movement phenomenon is often experienced in an integrative and spontaneous manner while the phenomenon is often studied in a categorical and methodical manner. The purpose of this study is to identify a means for examining the human movement phenomenon as it naturally occurs. It also explores the potential of the intuitive thinking process for lending insight into this phenomenon. The study is conducted through an interpretive inquiry of readings which attempt to unify apparent dualities in the context of their thesis. Readings from the disciplines of philosophy, religion, science, and physics are utilized along with testimonials of the human movement experience. The study is structured by first synthesizing discussions from the readings. It then relates the human movement testimonials to this synthesis. The study reveals that physical and spiritual and objective and subjective qualities of human movement were experienced in a unifying manner rather than as apparent dualities. This understanding is gained through the utilization of the intuitive thinking process. The study concludes that viewing the human movement experience in a unifying manner is reflective of the way human movement naturally occurs. The intuitive thinking process affords individuals the opportunity to view the human movement phenomenon in this manner.

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Thursday, April 7
9:00-10:15 a.m.

EXPLOITIVE DEMANDS OF INTERCOLLEGIATE SPORT PARTICIPATION AND THE STRUCTURAL CONTEXT OF WOMEN'S INTERCOLLEGIATE SPORT. Elaine M. Blinde, Southern Illinois University.

Women's intercollegiate sport has experienced unprecedented structural and philosophical change during recent years, resulting in programs which more closely emulate the male sport model. Although these changes are well-documented, the possible impact of such change on the female athlete has rarely been addressed. Therefore, the purpose of this study was to examine various facets of the intercollegiate sport experience of former female athletes who had participated in sport programs emulating the male sport model to varying degrees. Borrowing from feminist notions relative to the impact of male-defined structures on women, it was hypothesized that with increasing emulation of the male sport model, female athletes would be (1) more likely to describe their sport program and experience in terms of "male values" and (2) more likely to express feeling of exploitation relative to their intercollegiate sport experience. In order to test these two hypotheses, a 12-page questionnaire was mailed to 952 former female athletes who had participated in various sport programs at 10 Division I universities. Based on the athlete's responses, each athlete's sport program was evaluated and then placed on a continuum relative to the degree to which it emulated the male sport model ("program-type"). Two dependent variables were created utilizing factor analyses - "emphasis on male values" and "exploitive demands of college sport." These two constructs were correlated with the "program-type" construct. Pearson product-moment correlations supported the two hypotheses. An increasing emphasis was placed on "male values" as the sport program increasing emulated the male sport model. Furthermore, with both an increasing emulation of the male model of college sport and an increasing emphasis on "male values," female athletes were significantly more likely to indicate the presence of "exploitive demands" in their intercollegiate sport program. Based on these findings, it may be suggested that both the structure and value system of women's sport programs influence the nature and quality of the sport experience of athletes. Such findings may have important implications relative to the manner in which women's sport programs at all levels are organized.

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Thursday, April 7
9:00-10:15 a.m.

DEVELOPMENT AND VERIFICATION OF A GENDER-ROLE STEREOTYPING INDEX FOR PHYSICAL ACTIVITIES. Arlene A. Ignico, Ball State University.

The purpose of this study was to develop a valid and reliable instrument to measure the degree to which parents, teachers, and children (4 1/2 to 7) label physical activities according to gender. The research involved two phases: (a) development/validation of the instrument, and (b) reliability/stability assessment. Participants for the development/validity assessment were 12 experts in the area of motor and psychosocial development of children who were divided into two groups of six judges (three females, three males). Both groups of judges rated 45 research-based, gender-specific and gender-neutral physical activities according to the degree to which each activity involved each of 14 (nine male, five female) research-based, gender-specific physical activity characteristics. Based on the ratings of Group I judges, 30 physical activities, representative of ten male, ten female, and 10 gender-neutral physical activities, were identified and combined to make up the preliminary questionnaire. In order to assess the construct validity of the instrument, two steps were taken. First, two Pearson product-moment correlations were calculated comparing the ratings of the two groups of judges for the total list of activities for: (a) male activity characteristics (r = .98, p < .01) and female activity characteristics (r = .82, p < .01). Second, six one-way ANOVA's were calculated to determine if there were a significant difference between the two groups of judges on their ratings of the underlying constructs of gender-related activities. The results substantiated construct validity as the two sets of judges were not significantly different (p > .05) on any construct. To assess the reliability/stability of the instrument, 90 participants from each of the three population groups responded to the questionnaire on two occasions, three days apart. Results indicated that the instrument has high reliability/stability (r = .94 and r = .95, p = .0001) for the parents and teachers respectively, and moderate but acceptable reliability/stability (r = .77, p = .0001) for children between 4 1/2 and 7.

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Thursday, April 7
9:00-10:15 a.m.

GENDER DIFFERENCES IN ADOLESCENT SPORT INVOLVEMENT. Carol L. Durentini and Linda M. Lander, Bowling Green State University.

Previous research has identified gender and life cycle differences in the sport socialization process. The purpose of this study was to identify gender differences in adolescent sport involvement. A 96 item Sport Participation Questionnaire was administered to 119 male and 75 female high school varsity athletes. Four stepwise multiple regression analyses were conducted to determine the predictive influence of selected variables on the sport involvement of male and female athletes. The independent variables in the study were: 1) perceived ability in sports, 2) primary and secondary involvement of socializing agents, 3) parental expectations and 4) role model influence. Sport involvement was measured by: 1) the number of sports in which the athlete competed, and 2) the hours per week of current sport participation. Results indicated that perceived ability in sports, friends' interest, father's level of education, and friends' current participation, were significant ($p=.0001$) predictors of the number of sports in which males participated; the variables explained 32.5% of the variance. Father's education, father's expectation to participate, perceived ability in sports, father's occupation, mother's current participation, and friends' interest in sport were significant ($p=.0001$) predictors of the hours per week that males participated in sports; the variables explained 28.9% of the variance. Perceived ability in sports, mother's expectation to participate, and athletes as role models (-) were significant ($p=.0006$) predictors of the number of sports in which females participated; the variables explained 25.6% of the variance. Father's education, brother's primary involvement, friends' current participation, mother's expectation to participate, athletes as role models (-), and father's secondary involvement (-) were significant ($p-.0001$) predictors of the hours per week that females participated in sports; the variables explained 44.7% of the variance. Results indicate that perceived ability in sports is the primary predictor of the number of sports in which male and female athletes participate. The amount of time male and female athletes engage in sport is primarily influenced by socio-economic status. There are gender differences in the role of socializing agents. The amount of time males engage in sport is primarily influenced by fathers' expectations, mothers' primary sport involvement, and friends' secondary sport involvement. The amount of time female athletes engage in sport is influenced by the primary sport involvement of friends and male siblings, and mother's expectations.

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Thursday, April 7
9:00-10:15 a.m.

GENDER BIAS TOWARD COACHES IN INTERCOLLEGIATE BASKETBALL, TENNIS, AND CHEER TEAM ATHLETES. Joanie Larson-Gray, Eastern Montana College, Russell Lord, Eastern Montana College, Robert Grueninger, Eastern Montana College.

Dynamic changes in the athletic contributions of women and in the changing leadership roles of women in sports have been under continuous, albeit sporadic, investigation for fifteen years. This study was undertaken to expand the research on sex-bias of athletes toward those in the specific leadership role of coach. This study tested whether sex-bias influenced the evaluation of basketball, tennis, and cheer team coaching ability of male and female coaches with either a high or a low status (defined by won-loss records and coaching honors). Subjects were male and female (N=109) intercollegiate athletes from various-sized NCAA schools on the 1986-87 basketball, tennis, and cheerleading teams. The subjects were asked to read coaching philosophy statements which appeared to be different but were essentially the same in content from a male and a female coach in their sport who was described as having a winning or losing season. Subjects evaluated the coaches' knowledge of coaching, ability to motivate, player's desire to play for that coach, and predicted future success. The subjects were also asked to choose the coach they would rather play for should a job opening arise at their school. Results of several contingency analyses looking at effects of gender of player, gender of coach, and coach's status yielded mixed results. The 2x2 Chi Square using all sports was non-significant ($p>.05$). These results are contrary to previous studies conducted with younger athletes in basketball. This study failed to determine any overall pro-male bias in choice of coaches. The researchers realize that there is a tendency not to report studies that fail to show significant differences, but considering the sensitive issue and contradiction of previous work, feels that an illusion of gender-bias may exist. It is also possible that a pro-male bias may exist among high school basketball players but not among more mature collegiate athletes.

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Thursday, April 7
9:00-10:15 a.m.

AN INVESTIGATION OF GENDER BIAS IN THE EVALUATION OF ASSISTANT COACHING APPLICANTS BY MALE HEAD COACHES OF IOWA HIGH SCHOOL GIRLS' BASKETBALL. Mary K. Kriener, Sharon Ann Mathes, Iowa State University.

This study tested whether gender bias exists in head coaches evaluations of male and female coaching applicants varying in competence. Research on gender bias in athletics has shown that male coaches are more highly valued than female coaches by athletes, however, no research exists on the attitudes of head coaches toward assistant coaches. Subjects were male head coaches (N = 186) of Iowa high school girls' basketball. Coaches read background information concerning a hypothetical male and female assistant coaching applicant of either high or low competence. They rated the applicants on 28 items using an eight-point Likert Scale. Factor analysis of the items showed that they loaded into four factors - interpersonal skills, knowledge application, background preparation, and program development. A 2x2x4 multiple regression analysis examined the relationship of competency (high, low), sex (male, female) and the identified factors. This showed that the competency level of the applicants had a greater effect than gender on the scores assigned by coaches to applicants. High competent coaching applicants regardless of sex received higher evaluation by head coaches than low competent applicants. These differences varied by treatment group. In addition, head coaches were asked, using a forced choice format, to select which of the two coaches they would recommend be hired. Data showed that male head coaches preferred the female applicant rather than the male applicant. Results of this study suggest head coaches are not sex biased in the evaluation of assistant coaching candidates.

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Thursday, April 7
9:00-10:15 a.m.

PARTICIPANT AND NON-PARTICIPANT'S MOTIVES FOR INVOLVEMENT IN A CORPORATE EXERCISE PROGRAM. Amy McGivern, Sharon Ann Mathes, Iowa State University.

The purpose of the study was to examine what factors influence employee's desire to participate in a corporate exercise program and whether such factors vary among participants and non-participants. The sample was composed of 249 Principal Financial employees in Des Moines, Iowa. Ninety-one were corporate fitness participants and 158 non-participants. The instrument employed, contained 33 items which solicited information regarding personal motives for participation and 28 items that provided data regarding the importance of institutional factors (facilities, programming, scheduling) influencing involvement in an exercise program. Employees responded to each scale by recording a value from 1-7 indicating how important (1=not at all important, 7=very important) various factors were as the basis for involvement in the corporate exercise program. A factor analysis employing a varimax rotation was conducted for each scale. This produced a motive scale composed of seven factors. Mean scores for the total sample showed that the "weight" (M=5.56) factor was scored the highest followed by "fitness" (M=5.53), "stress" (M=5.11), "relaxation" (M=4.94), "social" (M=3.53), "reward" (M=3.07), and "smoke" (M=1.74). One way analysis of variance showed that participants differed significantly from non-participants on three motive factors (stress, fitness, relaxation). In each instance, participants scored these factors significantly higher than non-participants. Factor analysis of the institutional motives resulted in three major factors: sport, structure, health. For the total sample, employees scored the factor "structure" (M=5.47) the highest in importance for influencing their involvement in a corporate exercise program followed by "health" (M=4.38) and "sport" (M=2.61). One way analysis of variance showed that participants and non-participants differed significantly only on the institutional motive "structure" with participants scoring this significantly higher than non-participants. The data suggests that in addition to health related motives the structural design of the program (day, time, facilities) may exert an important influence on employees' participation.

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Thursday, April 7
9:00-10:15 a.m.

IDENTIFICATION OF LEADERS OF A PROFESSIONAL BASKETBALL TEAM.
Karen H. Weiller, University of Texas at Arlington.

The purpose of this study was to determine the leaders of a professional basketball team as identified by the team members, coaching staff, fans, and selected sportscasters and sportswriters. Data were collected by means of the sociogram and paired comparison methods, as well as the interview technique and short answer questionnaire. The data were analyzed by means of calculating the frequency of responses. A weighting system was applied to the sociogram to denote the strength and quality of leadership. A Spearman rho (rank correlation coefficient) was applied to the paired comparison method. The identified leader was the same for the players, coaching staff, and selected sportscasters and sportswriters. The fans indicated this player was their second choice as the one who contributed the most to the overall welfare of the team. Quite often in a professional, collegiate, or high school sport group, the head coach is the sole leader, with little or no thought given to possible uses for leader identification among players. The use of the sociogram and paired comparison instruments to identify leaders whom the players would look to as well as those leaders the coaching staff would select, can be a basis for identifying for the head coach where discrepancies lie between his/her thoughts and those of the players, thus improving communication between the coaching staff and the team.

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Thursday, April 7
9:00-10:15 a.m.

ENHANCING THE GROSS MOTOR AREA OF THE PRESCHOOL CURRICULUM THROUGH COLLABORATIVE RESEARCH. Sue Ellen Miller, Ohio University.

A university physical education professor, an early childhood administrator, and an early childhood teacher joined in a collaborative ethnographic research project to improve the gross motor curricular area of a university early childhood laboratory school. The status quo of gross motor programming at this child development center was determined by the early childhood administrator and the university physical educator through detailed field notes, videotaping, and discussions with the entire teaching staff at the child development center. It was determined that an intensive intervention strategy focusing on the work of one teacher would be used to effect change in the gross motor planning and implementation skills of the entire teaching staff at the child development center. The intervention strategy consisted of discussions between the physical educator and early childhood teacher, independent study and planning by the early childhood teacher using printed resource material, and finally, videotaping the early childhood teacher as she conducted small group gross motor activities with her 3-4 year old children. During the small group activities, the university physical educator was on the periphery to observe and/or make suggestions as each lesson progressed. This direct work with the teacher and her preschoolers resulted in more focused lesson plans and an increase in the length of time the teacher was able to interest and involve the children. Interviews with the early childhood teacher revealed increased confidence and a change in attitude with regard to the importance of gross motor planning. Following the small group intervention strategy, the early childhood administrator and physical educator met with the entire child development teaching staff to view and discuss the small group videotapes. Two months later, the gross motor programming of the entire staff was reviewed through observation of playground time, examination of lesson plans, and interviews. The changes were small but identifiable. Lesson plans showed more organization, teachers were actively engaging children in locomotor and manipulative activities on the playground, and they began requesting additional resources and assistance from the physical educator and each other. Implications of the research indicate that early childhood professional preparation programs should focus more on the gross motor curricular area, physical educators should be used as resource persons, and early childhood administrators should encourage their teachers to participate in collaborative research.

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Thursday, April 7
9:00-10:15 a.m.

CHILDREN, GAMES AND PROSOCIAL BEHAVIOR: INSIGHTS AND CONNECTIONS. Steven Grineski, Moorhead State University.

The purpose of this investigation was to determine the effect that cooperative and competitive goal structures had on the prosocial behavior interactions of young children. Seven girls and five boys, 5 to 6 years of age were randomly selected to participate in a games program two times per week for 40 minutes each session over a three week period. Five pair of games sharing a common goal were selected. Each pair of games had a cooperative and competitive goal structure version and were designed to possess identical components with the exception of the goal structure. A checklist with two behavioral categories was developed for use in recording the observed prosocial behaviors. These behaviors included positive physical contact (i.e. physically supporting, assisting or acting affectionate toward another child) and positive verbal nteraction (i.e. verbally encouraging, praising, reinforcing or helping another child). Two trained teachers observed six different children for a two minute period and recorded prosocial behaviors under each goal structure game. Inter-rater reliability conducted over the 3 week period revealed a coefficient of 90%. The 12 children participating in the 10 games were observed exhibiting a total of 230 prosocial behaviors. 96% (n=228) were associated with the cooperatively structured games, while 4% (n=2) were associated with the competitively structured games. The mean number of prosocial behaviors exhibited by the 12 participants during the cooperatively strucured games was 19, while .16 was the mean number of prosocial behaviors exhibited by the same children during the competitively structured games. Also, individual and group interviews conducted with participants yielded data that suggests games with cooperative goal structures were perceived more favorably by the players than games with competitive goal structures. Within the limitations of this study, it appears that young children are capable of prosocial behavior interactions with their peers and games possessing cooperative goal structures result in more prosocial behavior interactions for game players than games possessing competitive goal structures.

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Thursday, April 7
9:00-10:15 a.m.

ANALYSIS OF THE REVISED TEENAGE HEALTH TEACHING MODULES IN SELECTED ARKANSAS SECONDARY SITES. Betty Hubbard, University of Central Arkansas; Gary A. Lewers, University of Central Arkansas.

The purpose of the study was to determine the influence of increased training time in preparation for use of the Teenage Teaching Modules. The two null hypotheses were: increased training will not influence the classroom implementation rate by health educators; and the increased training will not influence the degree of effectiveness for student knowledge, attitude and behavior change. The study attempted to determine if one of the reasons for low utilization of the THTM project was the short duration of time devoted to training for each of the sixteen modules. The researchers attempted to determine the influence of reducing the number of modules covered and increasing the time devoted to the covering of each module in a workshop format. The revised training took place in a one-week resident summer workshop on the University of Central Arkansas campus. Twenty teachers, ten junior high and ten senior high, were selected on the basis of expressed interest. One full day was spent in training for each of six modules at the junior high level and six modules at the senior high level, as opposed to two hours for each of sixteen modules in the conventional training format. The participants used pre and post tests to determine changes in health knowledge, attitudes and practices in their respective classrooms. The pre and post test results of the workshop participants were compared with five junior high and five senior high classes which were instructed by teachers trained in the conventional method. The research design consisted of a quasi-experimental, non-equivalent, pre-test, post-test method. The ANOVA allowed comparison of health knowledge, attitudes and practices of secondary students exposed to the revised THTM training with students who received the conventional THTM and an equivalent control group. The analyzed data revealed that both null hypotheses were disproven. The researchers concluded that by revision of the existing (conventional) methods of THTM training the overall success of the THTM project could be enhanced. Of special consideration is the improvement of the 62 percent implementation rate which presently exists for the THTM post conventional training.

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Thursday, April 7
9:00-10:15 a.m.

EVALUATION OF THE "CHILDREN'S ACTIVIVE PHYSICAL EDUCATION" CURRICULUM. Bruce Simons-Morton, University of Texas Medical Branch; Guy S. Parcel, University of Texas Health Science Center at Houston; Nancy M. O'Hara, University of Texas Health Science Center at Houston.

The purpose of this research was to evaluate the effects of implementation in elementary physical education of a program of moderate to vigorous physical activity (MVPA). The Children's Active Physical Education Curriculum was implemented in the 3-4th grades in two Texas elementary schools; the two other schools in the district were controls (n=212). The curriculum consisted of a variety of aerobic physical activities integrated into four modules. Activities were progressive in duration over the course of the modules. Certified PE teachers received skills training in maintaining discipline, providing instruction and feedback, involving all children in activity, and making transitions from on activity to another and were involved in a personal fitness program. Using an observation form, trained technicians observed randomly selected children to assess the extent of MVPA. (Intensity levels were validated against pulse rates in a substudy.) Children in the experimental schools went from $X=2.4\pm3.7$ minutes per period MVPA at baseline to $X=14.4\pm7.9$ after two years, while controls were $X=.5\pm1.0$ at baseline and $X=3.2\pm3.7$ after two years. ANOVA time by treatment comparison was significant ($p < .01$), with no gender or school interactions.

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9:00-10:15 a.m.

CHILDREN'S SELF-REPORTED PARTICIPATION IN AEROBIC PHYSICAL ACTIVITIES. Bruce Simons-Morton, University of Texas Medical Branch; Guy S. Parcel, University of Texas Health Science Center at Houston; Nancy M. O'Hara, University of Texas Health Science Center at Houston.

The purpose of this research was to assess the type and amount of aerobic physical activity (APA) children obtain during school, before and after school, and overall. Trained facilitators administered a validated self-report questionaire in class on three consecutive days to 3-4th grade children (n=812) from 4 Texas public schools. The APAs that were engaged in most frequently during the total day for both boys and girls were running, group games, jogging, fast walking, and aerobics. Boys reported $\bar{X}$=1.71±2.31 APAs per three days at school and $\bar{X}$=3.28±3.72 APAs before or after school and girls reported $\bar{X}$=1.93±2.32 APAs at school and $\bar{X}$=3.19±3.50 APAs before or after school. Overall children received nearly twice as many APAs before and after school as during school. While 30% of boys girls reported obtaining 3 or more APAs, 33.49% of boys and 28.64% of girls reported obtaining no APA during school and 23.28% of boys and 25.83% of girls reported obtaining no APA before or after school. These findings are surprising, considering that the children participated in daily physical education taught by certified physical education teachers.

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Thursday, April 7
9:00-10:15 a.m.

RETHINKING POSTURE FOR THE HEALTH AND/OR PHYSICAL EDUCATION CURRICULUM. Sally A. Althoff, S. Margaret Heyden, Loarn D. Robertson, Portland State University

The value of good posture in promoting maximum physical performance and minimizing the potential for exercise related injuries has been repeatedly proclaimed in the health and performance literature. However, there is a paucity of information regarding programs designed to screen and inform students about their postural status. The purpose of this paper is to describe such a program in place at Portland State University as part of a required course in health and fitness, and to report data which supports the inclusion of posture screening in the health and/or physical education curriculum. The purposes of the posture screening program are: 1) to inform the students of their posture status, 2) to determine the implications of their screening results for beginning/continuing an exercise program, 3) to provide an opportunity for students to work on modifying their posture and 4) to refer those students with marked posture asymmetries to specialists. To accomplish this, posture screening is conducted by trained graduate assistants using an adaptation of the New York State Posture Test Form. Results are returned to students and instruction is given in interpreting results. Postural enhancement exercises are provided for all students and specific exercises strongly recommended for those with slight asymmetries. Students with marked asymmetries are referred to specialists for further evaluation including development of individualized exercise techniques. Data from a sample of 387 students show that almost 60% of students have a slight asymmetry for at least one body part, shoulders and neck being the major problem areas. At least 25% of students have slight asymmetries in the hip, low back, upper back and abdominal areas. Almost 3% of students have markedly asymmetrical posture in some body area. In general, posture problems are more prominent among male students than female; younger students (18-24 yrs.) than older (25+ yrs.); and below average weight students than average or overweight. Almost half of the students do not know about their posture status and 90% rate the screening program as valuable. Curricular implications are: 1) posture screening and instruction are needed at both college and public school levels, 2) more emphasis is needed in developing trunk musculature as opposed to extremeties in exercise programs, 3) in training for sports and competition more emphasis on cross-training is needed to balance musular development and 4) good posture needs to be emphasized as much for men as for women throughout the curriculum.

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Thursday, April 7
9:00-10:15 a.m.

PUBLIC SCHOOL HEALTH AND PHYSICAL EDUCATION PROGRAMS IN LOUISIANA.

D. Shelby Brightwell, Southeastern Louisiana University; Ed Dugas, University of Southwestern Louisiana.

The study was conducted to determine: curricular offerings in grades 6-12 [boys, girls, coed], problems limiting teacher effectiveness, economic/demographic status of teachers, professional memberships and attendance patterns, role diversification, usefulness of selected undergraduate courses, frequency of graduates [BS & MS] from Louisiana institutions of higher education and variables responsible for teachers continuing in the field of education. All public school teachers in Louisiana who taught health and physical education in grades 6-12 fifty percent or more of the time were surveyed. Teachers [N=917] from all 64 parishes and two city school systems responded [53% return]. Little attention was given to aquatics, dance, and gymnastics. Team sports were taught most frequently and individual/dual and fitness activities were offered on a limited basis. A coed format for classes was limited to selected offerings. Topics in health education were not always taught as required by State guidelines. Large classes and lack of equipment limited teacher effectiveness. The majority of teachers were under age 41. Mean salaries for males and females was $20,975 & $20,276, respectively. Less than 1/3 hold memberships in health and physical education professional organizations or attend meetings regularly. 83% of the males and 76% of the females coached. First aid and student teaching were courses most valued. The institution with the most graduates teaching in Louisiana public schools was Southern University [BS & MS]. Job satisfaction was given as the primary reason for continuing in the field of education.

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Thursday, April 7
9:00-10:15 a.m.

DIFFERENTIATED INVOLVEMENT IN RECREATIONAL PHYSICAL ACTIVITIES.

Linda M. Lander, Bowling Green State University.

Differentiated involvement in university physical education classes has previously been explained on the basis of incentive value motivation and movement preferences (Lander, 1983, 1985). The purpose of this study was to determine if incentive values and movement preferences are predictors of differentiated involvement in recreational physical activities. Construction of the Physical Activity Inventory was based on selection of predictor variables identified in previous research on incentive values and movement preferences conducted with university physical education classes. The 72 item inventory was administered to male (n=223) and female (n=390) participants engaged in physical activities at a university recreation center. Results indicated that 62.5% of the participants engaged in physical activity to improve or maintain fitness; 18.2% participated for the purpose of recreation. A stepwise discriminant analysis was performed using incentive values and movement preferences as predictor variables, and six activities (aerobic exercise, basketball, stationary cycling, jogging, racquetball, and swimming) as classification variables. The stepwise discriminant analysis yielded 8 predictor variables in the discriminant function. The discriminant function was used to determine the percentage of correct classification into the six activities. The prior probability of correct classification into the six groups was 16.7%. The discriminant function yielded the following percentages of correct classification for the six activities: basketball(66.7%); racquetball (55.2%); cycling (47.8%); aerobic exercise (46.2%); swimming (31.3%) and jogging (21.6%). The results of the discriminant analysis indicate that participants in certain fitness-related activities, such as jogging and swimming, have similar incentive values and movement preferences. Participants in certain sport-related activities, such as basketball, have incentives and preferences that distinguish them from participants in other activities. In summary, differentiated involvement in recreational physical activities can be explained by movement preferences and incentive value motivation. However, incentive values and movement preferences are more adequate predictors of involvement in sport-related activities than fitness-related activities.

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Thursday, April 7
9:00-10:15 a.m.

POLICIES AND PROCEDURES ON DRUG TESTING AND ASSISTANCE PROGRAMS FOR THE FEMALE STUDENT-ATHLETE, Darlene S. Young, Western Illinois University; Diana B. Young, Alcoholism Services of Cleveland, Ohio

Alcohol and drug use by intercollegiate athletes has recently become a focus for athletic personnel and physical educators as well as the public in general. The purpose of this study was to determine what policies and procedures were being utilized by National Collegiate Athletic Association (NCAA) women's sports programs for drug testing and identifying alcohol and drug problems among the athletes. Division I and Division III institutions were surveyed to determine whether there was a difference between institutions offering athletic scholarships and nonscholarship institutions. A 32-item questionnaire was developed through the use of a field test to collect the data. The questions focused on drug testing and student-athlete assistance programs; more specifically, the extent of drug testing, policies and procedures for drug testing, action taken as a result of a positive test, policies regarding alcohol use among athletes, status of athlete assistance programs, procedures dealing with the impaired athlete, and information and training of the athletic personnel and athletes. Two hundred seventy-three institutions, 134 from Division I and 138 from Division III, responded to the survey. Results of the study provide evidence that the subjects of drug testing and the student-athlete assistance program are being addressed by NCAA institutions. Overall, the issue of drug testing and the student-athlete assistance program has become a high priority for athletic administrators. Specific results from the study were: (a) A majority of Division I institutions had drug testing for athletes whereas only one Division III institution had drug testing; (b) Most of the drug testing conducted was mandatory and unannounced; (c) When an athlete tests positive for drugs, most often the department refers the athlete for treatment; (d) The majority of sports programs have no departmental policy regarding the use of alcohol by their athletes; (e) A majority of Division I institutions have or are planning a student-athlete assistance program whereas less than a quarter of the Division III institutions have one; (f) Overall action taken by institutions was to help the impaired athlete rather than punish her; and (g) over half of the responding institutions do not have required educational programs (e.g. alcohol and drug usage, intervention, and treatment) for the student-athlete or athletic personnel.

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Thursday, April 7
9:00-10:15 a.m.

A CONTRAST/COMPARISON OF NEEDS ASSESSMENT AND CURRICULAR EVALUATION FOR MANAGEMENT CAREERS IN ATHLETICS AND INTRAMURALS.

Dennie R. Kelley, Joy T. DeSensi, Mary Dale Blanton, Patricia A. Beitel, The University of Tennessee, Knoxville.

This study was part of a series of studies designed to determine: (a) employer expectations of sport managers, (b) employer evaluation of educational sport management programs, (c) existent components of sport management programs, and (d) student program evaluation. The purposes of this study were to: (a) assess the needs of management positions, and (b) obtain evaluation of sport management programs by management personnel from different sport program perspectives, i.e., college/university athletics and intramurals. According to theorists, there has been an increase in the demand for sport management positions, but there is lack of and need for empirical evidence upon which to establish the theoretical basis/content for programs to meet this demand. Thus, the significance of this research is that it provides a basis for planning curricula utilizing empirical evidence of the needs assessment and program evaluation by/for professional sport management in athletics and intramurals. The subjects for the study were management personnel in athletics and intramurals from the same group of randomly selected schools across the nation with stratification for AAHPERD districts and institutional size. Subjects were mailed a letter of explanation, survey instrument, and stamped return envelope. The format of the survey was primarily objective, but included some subjective questions. Data were analyzed using crosstabulations of all objective items by group, i.e., athletics and intramurals, and Chi square applied where appropriate. Results of the needs assessment provided evidence between groups for the relative degree of importance of: (a) specific criteria for hiring sport management personnel and on-the-job success, (b) types of management/leadership tasks, (c) educational background, and (d) specific certifications. The results of the program evaluation by the two groups indicated the amounts of and/or the degree of importance of: (a) previous job related experiences/practica/internships, (b) management/leadership task related courses, and (c) emphasis on program areas within the curriculum. Evidence was also provided concerning the diversity in the types of management positions and salary ranges. A handout includes a synthesis of these specific results. In summary, the breadth of the needs assessment and curricular evaluation by management personnel in athletics and intramurals provide part of the empirical evidence upon which to base sport management curricular planning and decisions.

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Thursday, April 7
9:00-10:15 a.m.

A COMPARISON OF TASK ANALYSIS AND LEADERSHIP STYLES OF MALE AND FEMALE PRACTICING SPORT MANAGERS AT SELECTED SPORT PROGRAMS THROUGHOUT THE UNITED STATES. K.A. Davis and K.J. Sowada, Rice University.

This pilot investigation sought to examine job parameters of practicing male and female sport managers and compare their subsequent leadership styles. Subjects (N=10 males, 10 female) were practicing sport managers at selected sport facilities. The bases for their inclusion in the investigation was the similarity in size, scope and nature of their facility. Initially 64 questionnaires were mailed with 20 club managers responding after two follow-up mailings. The results were computed, analyzed and then compared to a similar study performed by Davis, (1984) examining competency development of practicing sport managers. Implications from the study indicated disparities in what is desired as proper training for sport managers and what job responsibilities are emphasized in day to day management skills. Differences in leadership styles were also significant at the .05 level in male and female managers with males demonstrating greater task orientation and females emphasized human relation skills. There were noted similarities in male and female daily management tasks which emphasized more communication and problem solving skills and less emphasis on the traditional planning, organizing, controlling triad of job performance. These findings confirm the hypothesis that there exists a competency requirement gap between professional preparation and actual job performance by practicing sport managers. Future efforts by both areas should be aimed at understanding the unique demands of sport management training.

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Thursday, April 7
9:00-10:15 a.m.

AN EXAMINATION OF SPORT PARTICIPATION SATISFACTION WITHIN THE CONTEXT OF LEADER-MEMBER EXCHANGE THEORY. Robert W. Case, Indiana University, Bloomington.

The purpose of this study was to examine athletes' overall participation satisfaction and specific supervision satisfaction within the context of Leader-Member Exchange Theory (LMX). To date, no studies have been completed that test the various aspects of LMX theory in sport settings. This is despite the fact that studies completed in non-sport settings by Vecchio and Gobdel (1984) and Linden and Graen (1980) have shown that high LMX scale scores are closely associated with high levels of overall job and supervisor satisfaction. A basic premise of LMX theory is that within an organization role development results in differentiated role exchanges between the leader and subordinates. These role exchanges result in the formation of "in" and "out" groups. A total of 146 male soccer players (ages 13-17) attending a summer soccer skill camp completed the LMX scale which was designed to measure the extent of role exchanges taking place between leaders and individual followers. "In" and "out" groups were designated by scores above and below the overall mean on the LMX scale. Similar to previous studies in non-sport settings, it was hypothesized that "in" group members would score higher on the Brayfield and Rothe (1951) overall satisfaction scale than "out" group members. In addition, it was hypothesized that "in" group members would score higher on the Smith, Kendall, Hulin (1969) JDI supervisor satisfaction scale than "out" group members. Analysis of variance showed no significant difference between "in" group and "out" group members on the overall satisfaction scores. Likewise, ANOVA revealed no significant differences between "in" and "out" group member scores on supervisor satisfaction. It was concluded that overall and supervisor satisfaction may not be closely associated with LMX theory in selected sport settings. It was recommended that other variables such as performance and withdrawal/retention may offer significant findings similar to those detected in selected non-sport studies.

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Thursday, April 7
9:00-10:15 a.m.

A FIELD TEST OF THE LEADER-MEMBER EXCHANGE THEORY IN A SPORT SETTING. Robert W. Case, Indiana University, Bloomington.

The purpose of this study was to test the basic tenets of the Leader-Member Exchange (LMX) Theory in a sport setting. A basic premise of the LMX theory is that within an organization role development results in differentiated role exchanges between the leader and subordinates. These role exchanges result in the formation of "in" and "out" groups. The leader's relationship with members of the "in" group is characterized by open communications as well as trust and support. To date, no studies have been completed which test LMX theory in sport settings. A total of 178 female basketball players (ages 13 to 17 years) participated in this study. The leader-member role exchanges which occur between the coach and starters and nonstarters on a team appear to be very similar to those which occur between the leader and members of the "in" and "out" groups. Consequently, it was hypothesized that starters, as possible "in" group members, would score their coaches as being much more supportive and trusting than nonstarters who are possible members of the "out" group. The Leader Behavior Description Questionnaire (LBDQ) consideration dimension was used to assess leader support, trust, and mutual influence. It was also hypothesized that no significant difference would exist between starters and nonstarters on the initiating structure (task) dimension of the LBDQ since the LMX theory suggests that similar levels of task behavior exchanges take place between the leader and members of both the "in" and "out" groups. Results revealed that both hypotheses were confirmed. A one-way analysis of variance (ANOVA) showed that starters scored their coaches significantly higher on the consideration dimension than did nonstarters ($F\ 1, 176 = 45.12$; $p < .001$). However, no significant difference was found between starters and nonstarters on the initiating structure scores. It was concluded that the Leader-Member Exchange Theory may offer potential for the study of leadership behavior in sport from the perspective of role development and the resulting exchanges which occur.

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Thursday, April 7
9:00-10:15 a.m.

A FUTURISTIC INVESTIGATION OF DOCTORAL STUDY IN PHYSICAL EDUCATION; A DELPHI STUDY. Robert H. Martin, Genesis Health and Fitness Institute.

The purpose of this study was to examine the future of doctoral study in physical education. Specifically investigated for specified time periods were (1) the goals of doctoral study, (2) the areas of concentration, and (3) the knowledge or courses every doctoral student should have regardless of specialization. The importance of the study was the attainment of information that would aid the physical education administrator, professor and student in short and long term planning to keep up with the probable changes in doctoral study in physical education. The panel of experts in this study consisted of chairpersons of doctoral programs in physical education in the United States (N=31). The method or technique utilized in this investigation was the Delphi instrument consisting of three rounds. Round 1 generated 43 goals of doctoral study, 37 areas of concentration, and 34 courses or knowledge every doctoral student should have. These items comprised Rounds 2 and 3. In Round 2 the experts were asked to evaluate the items' probability and desirability of occurrence and to place the item in one of the following five time periods (1) already exists, (2) 1991-1995, (3) 1996-2000, (4) later than 2000, and (5) will never exist. Round 3 was similar to the previous round with the following additions (1) group means were marked, and (2) the subjects were asked to rationalize any response which deviated from the group mean. A summary of the findings for the "already exists" time period was the highly desirable goals were to produce researchers and teachers. The areas of concentration that were highly desirable were biomechanics, motor learning, exercise physiology, sport psychology, adapted physical education, adult fitness, curriculum and instruction, and kinesiology. The knowledge that was highly desirable was in research design and statistics. For the "1991-1995" time period some of the goals that were highly desirable were to assume a more respected role on university campuses and to develop data banks for comparitive studies.

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9:00-10:15 a.m.

RELATIONSHIP OF NON-JOB VARIABLES TO JOB SATISFACTION OF COLLEGE FACULTY. Chandler, S. Rollins College, and Johnson, D. J., Florida State University.

The purpose of this investigation was to study the influence of the quality of selected non-job related variables and job related variables on job satisfaction of college physical education faculty. Subjects for this study were 73 faculty members of physical education departments from across the United States. Surveys were sent to 100 randomly selected subjects with 75 returning the information. Two subjects did not complete the form correctly and could not be used. The random selection of subjects used the stratification technique using regions of the country and institutional size in an effort to obtain data from a variety of work environments. The instrument contained a demographical data sheet, an 11-item Quality of Life Index (QLI), and a job satisfaction questionnaire that provided a job satisfaction score plus scores on the importance of and satisfaction with different facets of the faculties job. The QLI identified the quality of non-job related factors. In an attempt to explain the variation in faculty job satisfaction, Stepwise Multiple Regression was run using the items of the QLI and the items related to importance of and satisfaction with job facets as the independent variables and the job satisfaction score as the dependent variable. Data analysis indicated that the non-job related variables that affected job satisfaction most were: size of the community, working near family members, family relationships, and cleanliness of the community. However, these factors only accounted for 45% of the variation in faculty job satisfaction. When all independent variables were considered, factors related to decision making on the job, size of the community, freedom on the job, and high probability of being promoted accounted for 75% of the faculty members' job satisfaction. Based on the results of this study, it may be concluded that other than the size of the community in which they live, college faculty's job satisfaction is determined by job related factors, and therefore, can be enhanced by the management technique of supervisory level administration.

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Thursday, April 7
9:00-10:15 a.m.

PRESSURES TO RESEARCH AND PUBLISH: HOW ARE COLLEGE/UNIVERSITY PHYSICAL EDUCATORS AFFECTED? Robert E. Koslow, The University of Alabama, Tuscaloosa, Alabama.

The pressures placed on college/university physical educators to research and publish have dramatically increased in recent years. It has been suggested that this increased pressure may hinder teaching effectiveness, increase the amount of fraudulent research, and hinder graduate students in their attempts at developing classroom teaching skills. In an attempt to examine these concerns, a survey questionnaire addressing these issues was sent to 170 physical educators who were awarded Fellow Status in the AAHPERD Research Consortium. Subject selection was limited to one Fellow per college/university. Of the 131 Fellows returning usable surveys, 57 were full professors, 41 were associate professors, and 33 were assistant professors. Over the past 3 years, the full professors averaged 5.25 data-based publications, the associate professors averaged 5.34 data-based publications and the assistant professors averaged 6.54 data-based publications. Only 35% of the assistant and associate professors indicated that the quality of their research did not suffer from the pressure to produce in quantity; whereas 85% of the full professors indicated that the quality of their research rarely suffered. A vast majority of the Fellows (83%) indicated that their research activities facilitate their classroom teaching. However, more than 50% of the Fellows indicated a concern for the lack of classroom teaching preparation they received as graduate students. In addition, only 11% of the colleges/universities where the Fellows were employed offered graduate courses in classroom teaching techniques and strategies. Finally, in response to questions concerning fraudulent research activities, 55% of the assistant professors, 31% of the associate professors, and 22% of the full professors indicated an awareness of dishonest research activities within their own department.

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Thursday, April 7
9:00-10:15 a.m.

THINKING DURING REST AND EXERCISE. B.J. Noble, R.E. Dillenburg, and A.L. Travsky, University of Wyoming, Laramie, Wyoming.

Changes in "thought" may be involved in the beneficial effect often observed using exercise therapy with depressed patients. Projective techniques show that light exercise promotes primary process thinking (e.g., fantasy). Klinger has developed thought-sampling techniques for the evaluation of flow of consciousness or "thought" under various conditions. Since thought-sampling has not been utilized to study exercise response, the purpose of this investigation was to evaluate the difference in "thinking" between rest and light intensity exercise among normal college-age (19-24 yrs.) participants. Sixty males and females were randomly sampled from the computer files of the registration and records office. Following orientation, two 30 minute treatments were randomly administered: complete rest sitting in a chair placed on a treadmill and light walking on the treadmill where the perceived exertion did not exceed 14 on the Borg Scale and the heart rate was not greater than 60% of age predicted maximum. Participants sat or exercised alone in a treadmill room devoid of most stimuli that might bias thinking. The investigator was in contact with participants via a buzzer system. The POMS was administered before and after each treatment to control for change in mood state. Every 5 minutes throughout each treatment participants were "buzzed" and asked to record what they were "thinking" into a tape recorder. Each participant was debriefed following each treatment to help classify the nature of, and precursors for, each thought. The resulting data was analyzed using a one-way ANOVA. No significant between-treatment differences in mood state were observed ($p > .05$). The participants showed significantly less ($p < .05$) secondary process thinking (e.g., problem solving) during exercise, i.e., they participated in more primary process thinking. In addition, thinking was significantly less ($p < .05$) negative during exercise. These data may support the hypothesis of enhanced mental health through exercise. The next step will be to study the effect of light exercise on "thinking" of depressed patients.

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Thursday, April 7
10:45-12:00 noon

APPLICATION OF FISHBEIN'S THEORY OF REASONED ACTION TO COLLEGE STUDENTS' EXERCISE BEHAVIOR. David L. Legg, University of Tennessee-Chattanooga; John Drowatzky and Stephen Roberts, University of Toledo.

The purpose of this study was to (1) investigate the General and Personal application of Fishbein's Model: The Theory of Reasoned Action to predict college students' general exercise behavior; (2) to identify using the Personal measure determinants of the attitude and subjective norm which influence the intention to exercise; and (3) to determine the type of participation which correlates the intention to exercise with exercise behavior. The data were collected using 100 randomly selected college students enrolled in required and non-required physical education classes. All hypotheses were evaluated at $p < .05$ level. Statistical analyses included Intercorrelations, Multiple Regression, Student T-test with Bonferroni's Correction, Chi-Square of Demographics and Pearson Correlations. Combined results of low and significantly equivalent intercorrelations between the general and personal measures; the low multiple R in regressions of the personal and general measure; and the personal measure better predicting intention than the general measure indicated Fishbein's Model was insufficient to predict college students' exercise behavior. Determinants of the personal measure were identified but were not significantly different between groups, except for high and low intenders. A significant Pearson correlation between the non-required intention and exercise behavior was determined. Several other significant differences exist but were not of practical significance in the study.

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Thursday, April 7
10:45-12:00 noon

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THE EFFECTS OF SUPERVISION AND SELF-MOTIVATION ON ADHERENCE TO EXERCISE IN A CORPORATE SETTING. S. O'Hanley, A. Ward, K. Bertagnoli, S. Wilkie, H. Sherman, J. Rippe, Department of Medicine, University of Massachusetts Medical Center, Worcester, MA 01605

This investigation compared rates of adherence between supervised and unsupervised groups in a corporate setting exercise program and evaluated the relationship between adherence and self-motivation. Twenty-one subjects, 8 males and 13 females aged 20-50 yrs were randomly assigned to supervised (SUP) (n=13, $\bar{x}\pm$S.D. age and Wt=31.6$\pm$8.5yr and 71.0$\pm$ 10.8 kg) and unsupervised (UNS) (n=8, $\bar{x}\pm$ S.D. age and Wt=32.5$\pm$ 10.1 yr and 75.3$\pm$ 15.4 kg) exercise groups. Percent fat was estimated from skinfolds. Subjects completed treadmill $\dot{V}O_2$ max tests and Dishman's self-motivation inventory (SMI). A score predicting adherence (ADH) was calculated from the SMI, Wt and % fat. Subjects walked 3-5 days/wk at 70-80% max HR for 18 wks. In addition, the SUP group met 1/wk for a group walk. Males and females differed only in Ht and Wt. Since there were no differences in training and adherence for males and females, the data were combined for each group. The pretraining data follow ($\bar{x}\pm$S.D.):

	%Fat	$\dot{V}O_2$max (ml/kg/min)	SMI	ADH Score
UNS	26.7$\pm$7.4	36.9$\pm$5.4	151.6$\pm$10.4	27.6$\pm$2.9
SUP	24.2$\pm$8.9	37.8$\pm$6.3	162.3$\pm$15.0	35.3$\pm$7.9*

*$p\leq.05$ SUP compared with UNS

Groups were not different pretraining except for ADH score. SUP compared to UNS walked more days (SUP= 59$\pm$ 18.7days, UNS=28.9$\pm$28.2 days; $p\leq.01$) and had a higher percent attendance (SUP=66.5$\pm$21.1%, UNS= 33.0$\pm$ 33.1%, $p\leq.01$). Only 3 of 8 UNS subjects (38%) walked 15 wks or more, while 8 out of 13 (62%) SUP subjects walked 15 wks or more. Correlations between SMI and days walked and % attendance were r=0.08 and r=0.12, respectively. The correlations were only slightly higher between ADH score and days walked and % attendance (r=0.16 and r= 0.20). Conclusions: Dishman's SMI and calculated adherence score did not distinguish between adherers and non-adherers in either group in this corporate population. However, supervision 1/wk compared to no supervision appears to maintain adherence.

Supported by a grant from The Rockport Company

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Thursday, April 7
10:45-12:00 noon

ADHERENCE OF WORKING WOMEN TO A SUPERVISED EXERCISE PROGRAM.
Powell D. McClellan, Middle Tennessee State University; Dale Henricks, Metropolitan Nashville Tennessee YMCA; Scott Bryan, Bluefield College.

The purpose of this study was to identify program characteristics which would be the most effective to maintain participation of working women in a supervised exercise program. Subjects (n=190) were women (mean age = 35.6 $\pm$ 10.15 yrs.) who worked at least thirty-five hours a week and attended an exercise class at least twice weekly. A questionnaire was developed based upon previous research related to exercise adherence. Through item analysis four general factors: demographic, situational, psychological and social were identified. An Alpha analysis coefficient of .71 was obtained for all factors. The questionnaire was completed by participants prior to an exercise session. Analysis of results was by percentage of responses to each question. Women most likely to participate were married, college graduates, working a flexible schedule. Factors related to adherence included: (1) feeling good about self {97.8%}, (2) achieving optimal health {96.0%}, (3) reducing stress {90.2%}, and (4) achieving desired weight {90.1%}. Factors not related to adherence were (1) Doctor's recommendation {9%}, and (2) socializing with co-workers {23%}. Exercise adherence appears to be influenced by a combination of personal and environmental factors. The desire to achieve personal health goals, and feeling good about self are important motivational considerations. Educational programs for reducing stress and weight management are important environmental provisions. A combination of these factors appear to be crucial in obtaining adherence of working women to a supervised exercise program.

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Thursday, April 7
10:45-12:00 noon

PSYCHOLOGICAL RESPONSES OF MALES AND FEMALES TO DIFFERENT WEIGHT TRAINING REGIMENS. Stephen M. Horowitz, Ph.D., Cleveland Clinic Foundation; Terry Todd, Ph.D., University of Texas at Austin: Jan Todd, M.S., University of Texas at Austin; Michael Ballinger, University of Texas at Austin.

Until recently, weight training has been relatively ignored as a potential activity for promoting positive mental health. This study examined the effects of two weight training regimens on stress, self-esteem, symptoms, lifestyle habits, and depression. Following informed consent, 69 male (M) and female (F) university students (Ss) were randomly assigned into circuit (CTM, N=13; CTF, N=11), and strength training (SM, N=17; SF, N=9) groups. The Control (C) group (M=11; F=8) consisted of volunteers from other P.E. courses. Ss completed questionnaires describing their psychological status pre- and post-training which was done 3 d $\cdot$ wk^{-1} for 10 weeks using both the Universal Gym and free weights. The Strength groups performed 4 sets using 100% 10RM on day 1, 90% 10RM on day 2, and 85% 10RM on day 3. The Circuit groups performed 4 circuits of 15 reps for 8 exercises with 15-20 s rest between exercises. Ss in the C group remained inactive during the training period. Repeated Measures ANOVA found no between-group differences for any variable. Paired t-tests revealed significant decreases for all subscales and overall stress for Ss in the CTM group ($p < .01$). The CM group reported a reduction in relationship stress ($p < .05$). Improvements in symptoms were reported only by SM and CM groups ($p < .05$), while SM subjects were found to also significantly reduce depression and stress vulnerability scores ($p < .05$). Females who circuit trained reported elevated levels of personal self-esteem ($p < .05$). Students who weight trained tended to improve psychologically to a greater extent than students who did not, although reported changes were not significantly different. In summary, an interaction was observed between gender and weight training regimen. Improvements over the 10-week study occurred almost solely in the men. A distinct relationship between physiological changes and psychological improvement was not observed, making this gender interaction difficult to explain. Circuit training appears to influence perceived stress levels, while strength training has a greater effect on the reduction of negative lifestyle habits in university students.

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Thursday, April 7
10:45-12:00 noon

CARDIOVASCULAR FITNESS AND THE CARDIAC RESPONSE OF FEMALE BASKETBALL COACHES. Jerry N. Rickrode, Gary A. Sforzo, and A. Craig Fisher, Ithaca College.

The emotional stress of coaching is apparent and may be considered a negative health factor. Several previous studies have concluded that enhancement of cardiovascular fitness may attenuate the cardiac response to experimentally induced stressors. The purpose of this study was to examine the relationship between the cardiovascular fitness of collegiate basketball coaches and their cardiac responses during critical game situations. Eight critical incidents that usually occur during a contest were identified by a team of individuals with significant basketball coaching experience. Five female coaches from two NCAA Division I and three NCAA Division III teams volunteered to wear a Holter monitor under game conditions and also undergo a submaximal cycle ergometer test. Pearson product-moment correlations were performed on heart rate at a standard submaximal exercise load (150 W, an indicator of cardiovascular fitness) and average heart rate during each of the eight critical incidents (an indicator of stress response). Significant relationships ($r > .85$, $p < .05$) were detected between exercise heart rate and stress response heart rate during three critical incidents, indicating that greater cardiovascular fitness was associated with a lesser critical incident stress response. High ($r > .70$) but statistically non-significant correlations were also found during three other critical incidents and also between average game heart rate ($r = .80$) and exercise heart rate. The occurrence of cardiac arrhythmias during game conditions was not useful in distinguishing subjects because very few were detected. These results allow us to suggest that cardiovascular fitness may be a moderator of the cardiac response of coaches to game stress. However, future studies designed for greater statistical and predictive power are needed to more clearly address this issue.

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Thursday, April 7
10:45-12:00 noon

EFFECTS OF DOSE AMOUNTS OF SMOKELESS TOBACCO ON AUTONOMIC CHANGE AND PERFORMANCE DURING REACTION TIME AND INFORMATION PROCESSING.
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It is well established in the smoking literature that the stimulant versus depressant effects of nicotine on the central nervous system are dose related (Armitage et al., 1969). The opposing responses to dose amounts of nicotine may also be evident through the use of smokeless tobacco, a substance which is becoming increasingly popular among athletes. Performance on tasks such as reaction time (RT) and rapid information processing may be influenced by the degree of stimulation or relaxation which the individual experiences from varying doses. This study was designed to assess the effects of varying dose amounts of smokeless tobacco on these types of tasks. Smokeless tobacco users (N=20) were measured for autonomic, psychological assessment, and performance on four different tasks. These measurements were repeated over four sessions to allow for variation in the dose given. The tasks included timed mental arithmetic, the Stroop Color Word test, choice RT, and RT/anticipation time. The measurements recorded were heart rate (HR), systolic (SBP)/diastolic (DBP) blood pressure, the state anxiety measure from the State-Trait Anxiety Inventory, and performance scores. Experimental subjects were given the following dose amounts of Copenhagen tobacco: no tobacco, 1/3 of their average amount, average dose, and average plus 2/3 of this amount. Dose and task order were randomized and counterbalanced respectively. Results indicated that SBP was significantly higher during all three dose amounts of tobacco compared with the no tobacco control session ($F_{1,19}=5.49$, $p < .05$). This is consistent with other literature (Ksir et al., 1986). However, there were no differences between each dose of smokeless tobacco. In addition, there were no other autonomic, psychological, or performance differences among the smokeless tobacco subjects. The failure to replicate previous dose response findings with cigarette smoking may be due to differences in rate of absorption where cigarette smoking has a 50% greater absorption rate through the lungs than smokeless tobacco has through the buccal mucosa (Wesnes & Warburton, 1978). Due to the lower absorption rate of smokeless tobacco, higher doses may not result in substantially higher levels of absorption and thus may not influence the autonomic, psychological, or performance measures. Rather than increasing the <u>amount</u> of tobacco, it may be necessary in future research to systematically increase the <u>frequency</u> of smokeless tobacco intake in order to produce a dose response curve.

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Thursday, April 7
10:45-12:00 noon

FURTHER TESTS OF EXERCISE INDUCED AROUSAL AND PERCEPTUAL-MOTOR PROCESSING. James H. Cauraugh & Angela R. Evans, University of Oklahoma.

Previous investigations of exercise induced arousal and perceptual-motor processing have reported conflicting results (Cauraugh & Evans, 1987; Tomporowski & Ellis, 1986). A possible explanation of the inconsistent findings is differential aerobic fitness levels within and between arousal groups. In this study exercise intensities were based on a prescribed percentage of each subject's functional maximum 0_2 uptake (VO_2 max), which was predicted with a maximum cycle ergometer test. On a subsequent testing day, the aim was to determine the effect of three levels of arousal (0%, 50%, and 75% of VO_2 max) on three perceptual-motor tasks. Subjects (n = 36) were randomly assigned to one of the arousal levels. Workload and heart rate were monitored while subjects completed each of the three perceptual-motor tasks. The three tasks were: (1) Bassin timer anticipation - 45 trials of 5 mph LED wave speed traveling 7 feet, (2) Slater-Hammel's (1960) transit reaction (response anticipation and inhibition) - 45 trials of an 800 ms sweeping sec hand on a clockface, and (3) Posner's (1978) reaction time and cost-benefit analysis - 75 reaction time (2-choice) trials as a function of precue type (valid, neutral, and invalid). An Apple IIE computer controlled the last two tasks. Mean total error, constant error, and variable error were calculated for both sets of anticipation data. The Workload x Trial Blocks (3 x 9 - Bassin; 3 x 6-Slater-Hammel) mixed design ANOVAs for each error score failed to identify any significant finding. Mean precue reaction times were analyzed in a 3 x 5 (Workload x Precue Type) ANOVA with repeated measures on the last factor. The analysis revealed precue type differences, $F(4, 132) = 3.84$, $p < .01$. The valid (80%) precues in the left and right directions ($\underline{M}s$ = 268 ms) were significantly faster than the two invalid (20%) precues ($\underline{M}s$ = 290 ms). The failure to find reliable anticipation or reaction time differences across the arousal levels contrasts with earlier findings. The present results suggest that the procedures for manipulating short duration exercise induced arousal levels, other than a percentage of VO_2 max, may produce a confounding effect.

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Thursday, April 7
10:45-12:00 noon

AN ASSESSMENT OF TRAIT ANXIETY AND MOTIVES FOR COMPETITION AMONG MEMBERS OF THE UNITED STATES RACQUETBALL TEAM. Ronald Pinnell, University of Central Florida; L. Keith Tennant, University of Florida.

The purpose of this investigation was to determine sport specific trait anxiety levels and competition motives of world class racquetball participants. Subjects (N = 16) were members of the United States National Racquetball team that were scheduled for participation in the 1986 IARF World Championships. Subjects were administered the Sport Competition Anxiety Test (SCAT) and three scales designed to measure competition-related motives in sport that identified the power motive (PWR), the motive to approach success (MAS), and the motive to avoid failure (MAF). These dependent measures were administered in a neutral, non-competitive environment 2 days prior to the start of a playoff selection process. Independent variables included experience (1 to 4 yrs, 5 to 13 yrs), gender (male, female), and participation (qualifier, nonqualifier) with two levels of each variable considered for analysis. Data were analyzed using ANOVA with a 2 x 2 x 2 factorial design. Significant differences were obtained on the participation variable for SCAT (F 2,13 = 6.17, $p < .05$), MAS (F 2,13 = 10.24, $p < .05$), and MAF (F 2,13 = 4.76, $p < .05$). Results for participation indicated the tournament qualifiers' SCAT mean score (M = 19.66) was significantly higher than the mean for nonqualifiers (M = 13.83). Also, qualifiers were significantly higher than the nonqualifiers on the MAS (M = 69.20, M = 63.00) and MAF (M = 33.00, M = 28.16) measures. Values obtained for experience and gender were not significantly different on any of the dependent measures. It appears that years of experience and gender differences among world class racquetball competitors are not critical concerns when assessing anxiety levels or competitive motives. However, those players that qualified for tournament competition possessed higher sport specific trait anxiety levels and indicated a greater need to achieve success and avoid failure.

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Thursday, April 7
10:45-12:00 noon

IDENTIFICATION OF CHARACTERISTICS DIFFERENTIATING SUCCESSFUL AND UNSUCCESSFUL PERFORMANCE IN HIGH AND LOW RISK SPORT ATHLETES. David Siegel, University of Colorado.

In recent years sport psychology has sought to identify characteristics of successful and unsuccessful performers as well as identify characteristics of participants in high and low risk sports. The present study examined risk taking behavior and attempted to distinguish successful performance in high and low risk athletes. In introductory psychology, students (N = 163) were administered an inventory to determine perceptions of high and low risk sports. Based on this survey the high risk sport of sky diving and the low risk sport of bowling were used as the comparison groups in this study. Sky divers (N = 46) and bowlers (N = 64) were administered the Personal Resources Inventory (PRI) which is made up of the Rosembaum Resourcefulness Scale, Levenson's Locus of Control Scale, Tennessee Self-Concept Scale, Eysenck Personality Inventory, the State-Trait Anxiety Inventory, Zuckerman's Sensation-Seeking Scale, and the Mahrabian Need for Achievement Scale. Data analysis using a MANOVA for the 2 (sport) x 2 (high/low performance) design produced a significant main effect. For sport type $F = 5.58$, $p < .0001$. Subsequent univariate analyses indicated that sky divers were significantly more resourceful, were more internal in locus of control, and were lower in state and trait anxiety than bowlers. In addition, sky divers were higher in all aspects of sensation-seeking and were higher in need for achievement than bowlers. Significant main effects were also obtained for high and low performers $F = 2.75$, $p < .0001$). Subsequent univariate analyses indicated that high performers were significantly lower in state anxiety and higher in need for achievement than lower performers. Regression analyses revealed that for bowlers, trait anxiety was most predictive of performance accounting for 14% of the between group variance. Need for achievement was most predictive of successful sky diving accounting for 20% of the between-group variance. The potential for the development of selection tests for athletes is discussed.

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Thursday, April 7
10:45-12:00 noon

THE RELATIONSHIP BETWEEN THE COMPETITIVE STATE ANXIETY INVENTORY-2 AND SOCIAL DESIRABILITY. Vikki I. Krane, University of Illinois; Jean M. Williams, University of Arizona.

Self-report measures of psychological states are commonly used in sport psychology research and practice, yet the possibility of response bias due to social desirability often has been overlooked. To ignore this possibility is to assume that athletes never distort their responses on psychological inventories. At the time the CSAI-2 was developed, Martens et al. (1983) tested for response distortion due to social desirability. The anti-social desirability instructions they developed appeared to be adequate in defending against response bias. With each passing year, however, many athletes and coaches are becoming more knowledgeable regarding mental skills training. This new knowledge may be influencing responses on self-report measures of psychological states. Athletes, and particularly athletes who score high on social desirability, may be more hesitant to admit lack of confidence or excessive anxiousness immediately prior to competition when they are trying to create a mental atmosphere for optimal performance. The present study was designed to examine whether or not a significant relationship exists between social desirability and each of the CSAI-2 subscales. The participants were 67 female collegiate golfers representing 13 NCAA Division I universities competing in an invitational golf tournament. Cognitive anxiety, somatic anxiety, and self-confidence were assessed with the CSAI-2. The Marlowe-Crowne Social Desirability Scale was used to measure response distortion. Golfers completed the CSAI-2 approximately 5-10 minutes prior to teeing off on the first and second rounds of the tournament. Pearson product-moment correlations were computed to examine the relationship between the Marlowe-Crowne Social Desirability Scale and each of the CSAI-2 subscales. Self-confidence (.45, .38), and to a lesser extent, cognitive anxiety (-.24) appeared to be influenced by social desirability distortion. After examining self-confidence in world-class gymnasts, Vealey (1986) suggested that these elite athletes would not consciously admit to feelings of diffidence. This appeared to be true of the collegiate athletes in the present study as well. If the present findings are replicated in future studies using the CSAI-2 and other inventories, the field of sport psychology may need to re-examine some of the theoretical and application conclusions drawn from previous research in which no attempt was made to eliminate data from subjects who may have distorted their responses.

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Thursday, April 7
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ANTECEDENTS OF SPORT TEAM COHESION: PREDICTORS OF A MULTIDIMENSIONAL CONSTRUCT. Carol A. Gruber, The University of Iowa.

The structure and dynamics of sport team cohesion has become an increasingly important field of investigation for those interested in the performance, satisfaction, and stability of sport teams. Recent theoretical developments by Carron (1982) indicate that sport team cohesion may be multidimensional in nature. Four dimensions of antecedents have been identified by Carron in his conceptual system. These dimensions include environmental, personal, leadership, and team antecedents. Carron has identified four specific types of sport team cohesion that are present in varying degrees for each individual, and has operationalized their measurement in his Group Environment Questionnaire (GEQ). The present investigation was concerned with identification of the perceived multidimensional antecedent variables to sport team cohesion. Two-hundred fifty-five USVBA and city recreational volleyball players were asked to complete five questionnaires which measured 24 different antecedent variables, and 4 dimensions of sport team cohesion. Perceptions of individual orientation, satisfaction, desired coach's behavior, team interpersonal relations, desire for group success, and expectation of success were measured, along with a number of demographic variables. Results indicated that 11 of the possible 24 antecedent variables predicted the 4 types of sport team cohesion in Carron's GEQ measure. Four separate stepwise multiple regression analyses indicated that a combination of 3 or 6 antecedents accounted for any one type of cohesion. Specifically, the perceived general functioning of the team, member satisfaction, and the desired training behavior of coaches were major overall predictors in three of the four regression analyses. The nature of these predictors is multidimensional and supports Carron's overall theoretical concept. Support was found for Carron's contention that sport team cohesion can be separated into social cohesion and task cohesion. The desired social support behavior of coaches, affiliation orientation, and the level of team organization predicted social cohesion but not task cohesion. ANOVA results indicated sex differences in perceptions of sport team cohesion for USVBA team members but not for city recreational players. Suggestions for future research on sport team cohesion included further investigation of the exact role that each identified predictor plays in the development of sport team cohesion, analysis of the differences in sport team cohesion for various sport groups, and a determination of how each dimension of sport team cohesion affects performance outcome.

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Thursday, April 7
10:45-12:00 noon

A LONGITUDINAL ASSESSMENT OF SOCIAL FACILITATION EFFECTS UPON CHILDREN AT AGES 4, 8 AND 12. Mary J. MacCracken, The University of Akron; Robert E. Stadulis, Kent State University; Kayla Hughes, The Ohio State University.

To determine the developmental effects of the presence of other peers upon motor performance, the same group of children (N=31 of the original 40 children tested in 1979) had their dynamic balance assessed when 4-, 8-, and 12-years-old. The boys (n=17) and girls (n=14) attempted to walk forward and backward on wide (9.9cm) and narrow (4.5cm) balance beams raised 1 foot above the floor. The distance to the first step-off and the total number of step-offs evidenced while completing the 12 foot beam distance were the primary measures. The children were tested under three social situations: alone (tester only present), coaction (peers of the same sex and skill level performed side-by-side), and spectator (five peers observed the child performing). To assess the effects of sex, age, situation and practice (trials), separate factorial ANOVAs, simple effect analyses and Tukey hsd procedures were conducted for both easier and more difficult task performance. Task difficulty was determined intra-individually. For boys, little evidence of a change in the pattern of social facilitation motor performance effects was apparent over the 8-year period. The girls, on the other hand, seemed more affected by the presence of others, particularly when performing more difficult tasks. While there was little evidence of the presence of social facilitation effects at age 4 for the girls, at 8-years-old, the girls performed best ($p<.05$) in the coaction situation as compared to the other situations. At age 12, the first trial under the coaction condition while performing the more difficult task (for most children, walking backward on the narrow beam) resulted in poorest performance. Thus, developmental changes in dynamic balance performance as a result of social situation factors appears to be more evident in girls than in boys. The nature of the task, balance beam walking, may have diminished potential social facilitation effects for the boys; i.e., the task would appear to be stereotyped more important for girls than for boys.

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Thursday, April 7
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EFFECTS OF GENDER, ETHNICITY, AND EXPERIENCE ON ATTRIBUTIONAL DIMENSIONS OF HIGH SCHOOL TRACK AND FIELD ATHLETES.

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The purpose of this study was to identify possible differences in causal attributional dimensions made for hypothetical success and non-success individual track and field situations by New Mexico high school athletes. The variables selected were: (1) gender (female and male), (2) ethnicity (Anglo, Black, Chicano/Hispanic, and Native American), and (3) years of experience in high school track competition (1, 2, 3 or more). The Causal Dimension Scale (Russell, 1982) was used to determine the attributional dimensions relating to (1) locus of causality, (2) stability, and (3) controllability. The 755 subjects (ages 13-18 years) were members of the track teams from 32 randomly selected New Mexico high schools. Two 3-way MANOVAs were used to analyze the data for success and non-success situations. Simplified discriminant function coefficients, structure coefficients, and univariate ANOVAs were used to interpret the results of the MANOVAs. Scheffe's post-hoc comparisons were made to detect group differences following significant main effects. The results indicated that the causal dimensions perceived in either a success or a non-success situation did not differ significantly for female and male athletes or for athletes with varying years of competitive experience. There also were no differences in the interaction of gender and ethnicity or gender and experience. There was a significant difference among ethnic groups in how they attributed success and non-success. Multivariately, Anglos perceived their success as more internal and controllable than either Blacks or Native Americans; Anglos also perceived their non-success as being more internal and controllable and less stable than Native Americans. Univariately, Anglos perceived their non-success as more controllable than Blacks. Although all ethnic groups attributed success more internally than non-success, both success and non-success were attributed more to internal than to external causes. Athletes perceived successful situations to be stable; whereas, unsuccessful situations were considered to be unstable. Successful situations were also perceived to be more controllable than non-successful ones; however, both successful and non-successful situations were perceived as controllable.

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Thursday, April 7
10:45-12:00 noon

SEX DIFFERENCES IN VARIOUS COGNITIVE PARAMETERS IN A COMPETITIVE SITUATION.
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Research has supported male and female differences in perceived competence (Nicholls, 1976), the selection of causal attributions for success and failure outcomes (Deaux & Farris, 1977; Iso Ahola, 1979; Nicholls, 1975), and expectancies (Crandall, 1969, Montanelli & Hill, 1969). Early investigations revealed that females are more likely than males to attribute failure to a lack of ability (internal, uncontrollable, stable factors) (Dweck & Repucci, 1973; Nicholls, 1975). Additionally, females more frequently tend to attribute their success to situational factors (external, uncontrollable, and unstable factors), whereas males tend to attribute their success to internal, uncontrollable, stable factors. Furthermore, males' expectations and perceived competence are higher than females' expectations and perceived competence. Recent findings suggest that these sex-linked differences between males and females may be diminishing, particularly for specific tasks (Rudisill, 1985, Rudisill & Pemberton, 1987). For example, Rudisll and Pemberton found that differences existed between males and females for expectations and the selection of causal dimensions when performing a gender appropriate task but not for motor tasks that were not considered gender related. These investigations, however, required the subject to perform various motor tasks in a non-competitive situation, while the subject's outcome was determined by the experimenter. Therefore, it was the purpose of this study to compare male and female cognitive responses when competing in an actual competitive win/lose situation. Male and female college age students (N=82) volunteered for this investigation. Each test session involved two subjects who competed against each other in a dart tossing competition. Once a trial (5 tosses) was completed, the subjects' scores were tallied. Subject's then responded to a series of questionnaires, based on their outcome. Included in this series was a causal dimension questionnaire, a perceived competence scale, and an expectancy scale. Results for each of the causal dimensions (locus of causality, controllability, stability) revealed that there were no sex differences for causal dimension responses. Sex differences were found between subjects who won or lost for the controllable and stable dimensions. This result is supportive of past findings. Subjects who won attributed their success to more controllable and stable causes than those subjects who lost at the dart tossing competition. Conversely, sex differences were found for perceived competence. Males, reguardless of the win/lose outcome had higher perceived competence than females, supporting past studies. Additionally, a significant sex x outcome interaction was found for expectations. Males who did not win at the dart tossing task had higher expectations for future performance than the females who lost and the winning males and females. This finding also supports earlier investigations. In summary, there appears to be no difference between males and females in selecting causal dimensions when placed in an actual competitive situation. Interestingly, this appears to be true even when the task is one that is typically considered a "male appropriate task". On the contrary, sex differences continue to exist for perceived competence. These results are discussed in terms of the changing trends between sex differences and the attributional process and its implications on future application.

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Thursday, April 7
10:45-12:00 noon

ROLE OF PERCEIVED LEADERSHIP IN RELATION TO SITUATIONAL AND PSYCHOLOGICAL FACTORS IN YOUTH SPORTS. Mary E. Engelman, University of Houston; Dale G. Pease, University of Houston.

Competency in sport skills has shown to be very important to children (Roberts, 1978, 1980). However, most studies have looked primarily at the physical skill component or the product outcome. There would seem to be other factors that contribute to the assessment of one's worth in a sport context. One such factor is the player's leadership ability based on the perceived acceptance/expectations of leadership from other team members. The purpose of this study was to investigate perceived leadership role as it relates to other situational and psychological factors that are apart of the sport setting. One hundred and eighty boys and girls (ages 11-13) responded to a questionnaire that included the Washington Self-Description Questionnaire, Bailer-Cromwell Locus of Control, plus investigator developed scales for importance of participation, perceived role of leadership and social comparison. Internal consistancy for the developed scales was .65, .57 and .77 respectively. Multiple regression analysis showed that self-esteem, type of team (indication of ability), participation and locus of control were significant positive predictors of perceived leadership, Multiple R=.46; $F(4, 181) = 11.89$; $p<.001$; $R = .23$. Perceived soccer ability significantly correlated with perceived leadership ability ($r=.33$). Boys reported a stronger desire to be a leader than did girls. Discussion will focus on the role of perceived leadership as it relates to the notion of skill mastery in judging one's competency.

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Thursday, April 7
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VARIATIONS IN COACHES' ACHIEVEMENT ORIENTED BEHAVIORS AS A FUNCTION OF COMPETITIVE LEVEL AND SITUATION. Nigel R.Chaumeton and Joan L. Duda. Purdue University, West Lafayette, IN 47907

The purpose of this study was to determine the behavioral variations of coaches which occur in relation to the situation and level of competition. Four elementary, four junior high, and four high school varsity boys' basketball coaches were observed during 2 practices and 2 competitive games. Their behaviors were coded by two trained observers using a modified form of the Coaching Behavior Assessment System which distinguished between social reinforcements presented as a function of the performance process or performance outcome. The coaches completed a questionnaire which assessed the emphasis placed on task-involvement (i.e., skill mastery) and ego-involvement (i.e., beating others) in their personal goals and in the perceived goals of their athletes. The 124 athletes also responded to a questionnaire examining the importance they personally placed on task and ego-involved goals. Results revealed significant variations in coaches' use of outcome-oriented and process-oriented reinforcements and desirable and undesirable behaviors (based on the guidelines developed by Smith and Smoll, 1979) as a function of competitive level and situation. The goals of the coaches and athletes, and the coaches' perceptions of athletes' goals, suggested that at higher levels of competition an increasing emphasis is placed upon winning. Findings are discussed in relation to Nicholls' theory of achievement motivation (1984).

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Thursday, April 7
10:45-12:00 noon

THE DYADIC RELATIONSHIP OF PARENTAL AND YOUTH EXPECTATIONS: AN EXPLORATORY ANALYSIS OF MOTIVES AND ATTITUDES. Penny McCullagh, Jim Stiehl, and Jeff Caird, University of Colorado, Boulder.

Within the last ten years, researchers have shown increased interest in youth sport. For example, a number of research studies have focused on coaching behaviors (e.g. Smith, Smoll, & Hunt, 1977) participant attitudes (Gill, Gross, & Huddleston, 1983) and reasons for discontinuing youth sport participation (Burton & Martens, 1986). One hypothesized explanation for the alarming drop-out rate is that youths and parents may have discrepant attitudes regarding participation. Parents may be outcome oriented and may deem winning as most important, whereas youth are more intrinsically motivated to have fun and develop skills (Roberts, 1984). The present investigation sought to investigate this possibility. Subjects were summer swim-league participants (N = 121) and their parents (N = 80). Sports participants completed the Gill et al. (1983) participation motivation questionnaire with an additional four items taken from Wankel and Sefton (1987), the Sport Competition Anxiety Scale (Martens, 1977) and an adaptation of Harter's perceived competency scale. Parents completed the motivation scale and a shortened version of the perceived competence scale for this exploratory investigation. The primary purpose was to compare parental-youth attitudes. The analyses indicated that the three most important reasons for participating in sport as answered by the youths were to have fun ($\underline{M}$ = 1.18), to feel good for playing well ($\underline{M}$ = 1.18), and to stay in same (M = 1.29). For parents the primary reasons they thought their children participated were to have fun ($\underline{M}$ = 1.15), to feel good for playing well ($\underline{M}$ = 1.33), and to do something they were good at (M = 1.49). The findings for youths parallel other findings recently reported in the literature (Gould et al., 1985). Further age characteristics are discussed as well as practical implications for the parent-child interaction in terms of discrepant goals and subsequent attrition problems.

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A COMPARISION OF MOTIVATIONAL ORIENTATIONS AND INSTRUCTIONAL STRATEGIES ON FORM AND ACCURACY IN TENNIS. William S. Little, University of Colorado.

The present study examined the effects of different instructional strategies and motivational orientations on the learning of the tennis forehand. As a secondary concern, this study also conducted a behavioral validation of the intrinsic/extrinsic motivation scale (Weiss, Bredemeier, & Shewchuck, 1985). Subjects, whose motivation to participate in sports was either one of intrinsic mastery or extrinsic mastery, were randomly placed in one of two instructional groups and participated in a three day acquisition period to learn the tennis forehand.

The two instructional groups differed in terms of what was emphasized during the training acquisition phase. Subjects viewed demonstrations of the forehand and either the outcome of the stroke was emphasized (Knowledge of Results) or the form of the stroke was emphasized (Knowledge of Performance). The subjects subsequently went through a one day testing phase in which both outcome and form scores were recorded. A Model Only Control Group completed the same phases and was also scored on their outcome and form performances.

It was predicted that the Knowledge of Performance group would outperform the Knowledge of Results and Control group during the testing phase. It was also predicted that subjects high in intrinsic mastery would perform better under the Knowledge of Performance instructional strategy, whereas subjects high in extrinisic mastery would perform better under the Knowledge of Results condition.

Analysis of acquisition outcome scores yielded no significant differences between instructional strategies or motivational orientations. Analysis of the test phase outcome scores yielded similar results, although it was apparent that the Knowledge of Performance (KP) group performed superior to the other two groups. Significant group differences, as well as a significant instructional group by motivation interaction, were found in the analysis of the form data recorded in the test phase. Contrary to previous resesarch, the results indicated KP as the superior instructional strategy. The interaction results and the results of a post acquisition questionnaire partially supported the prediction of differing motivational effects and suggested a partial, though not complete validation of the Weiss, Bredemeier, and Shewchuck (1985) motivational scale.

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10:45-12:00 noon

STRESSORS OF PARENTS OF HANDICAPPED CHILDREN. A. Blair Irvine, George H. S. Singer, Larry K. Irvin: Oregon Research Institute; Lorraine G. Davis: University of Oregon.

Recent literature suggests that minor life events are an important source of stress, but relatively little is known about specific stressors. In this research, two scales to measure minor life events were administered to 76 parents of handicapped children. The first instrument, a Hassles scales, measured perceptions of common and potentially stressful events, while the second, the Parental Stress Questionnaire (PSQ), measured perceptions of potentially stressful events specific to parents of handicapped children. Results were compared with clinical indicators of stress, including the Beck Depression Inventory and the State Trait Anxiety Inventory - State and Trait (STAI-T) scales. Depression scores correlated ($p < 0.05$) with an index of perceived severity and total stress scores on both the Hassles and PSQ scales. Frequency, severity and total scores on the generic Hassles scale, but not the PSQ, correlated significantly with the STAI-T scale. Uplifts or positive life events also measured by the Hassles scale were not significantly correlated with any of the clinical stress indices. Item analysis of the generic Hassles instrument indicated that financial matters, household tasks, and "children" had the highest intensity score and occurred most frequently. The PSQ scores showed behavior management (e.g., misbehaviors) to be most stressful, while items involving considerable parental time occurred most frequently. These results suggest that relatively minor events which occur commonly can be stressful. Perhaps by identifying the events that are most stressful or occur most frequently, stress management programs can better train participants to cope with stressors.

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BEING FEMALE AND ATHLETIC: A CAUSE FOR CONFLICT? Gloria S. Desertrain, University of California, Berkeley; Maureen R. Weiss, University of Oregon

This study was designed to examine the interrelationships among role conflict, gender-role orientation and female sport participation. One hundred and six female high school students were classified as athlete (n=74) or nonathlete (n=32). All subjects were administered a sport background inventory, a role conflict inventory and the Personal Attributes Questionnaire. Perceived and experienced role conflict scores served as the dependent variables with athlete status, gender-role orientation and sport type serving as independent variables in a series of multivariate designs. First, athletes and nonathletes were compared on levels of perceived and experienced role conflict. Then, in order to determine whether role conflict differed based on the gender-role orientation of the participant, athletes were classified into one of four categories based upon their scores on the Personal Attributes Questionnaire: androgynous, feminine, masculine or undifferentiated. Differences in perceived and experienced role conflict were determined in analyses using the gender-role orientation classification as the independent variable. Finally, differences in role conflict among athletes in team, individual and combined sports were examined. Multivariate analyses revealed that athletes experienced significantly higher levels of role conflict than nonathletes. However, a nonsignificant relationship was found between role conflict and gender-role orientation. Role conflict was unrelated to the type of sport in which the athlete participated, although team athletes high in feminine-orientation perceived higher role conflict than low feminine-oriented team athletes. Overall, levels of perceived and experienced role conflict were low, but prevalent, among high school female students. The low levels of reported role conflict might be due in part to the increase in societal acceptance of the female athlete through greater visibility and increased opportunities. Results of this study imply that adolescent female athletes generally are not experiencing a problematic discrepancy between their gender-role behavior designated by society and their sport participation.

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PROFILE OF A MARATHON RUNNER: ATTITUDES, PERCEIVED BENEFITS, AND ADDICTION POTENTIAL. Susan G. Ziegler, Cleveland State University.

A dramatic increase in the number of people engaged in running has been a social and psychological phenomenon of the 1970's and 1980's. Running has been heralded as a form of therapy (Greis, et. al. 1978; Orwin, 1973), a medical concern akin to anorexia (Sours, 1981), a condition of terminal helplessness (Graham, 1979), a treatment for depression (Weinstein and Myers, 1983), a negative addiction (Morgan, 1979) and a positive addiction (Sacks, 1981). Distance running has been contrastingly viewed as a vice (Epstein, 1981) and as a coping strategy (Sacks, 1981). This paradoxical nature of running was the focus of this research. The purpose of this study was to survey marathon runners to determine their level of dependence on running and to explore the relationship of running to their personal, social and professional selves. This study surveyed 407 randomly selected marathon runners from the 1987 Revco marathon to determine the impact of running on their lives. Subjects were classified as runners or joggers based on their training speed, times run per week and best finishing time for the marathon. Subjects were given surveys on running addiction, work needs assessment, general attitudes towards running, benefits of running, and a running history scale. Data will be examined to compare the worker/runner self-identity (Joseph & Robbins) with commitment and addiction data. A marathon runner's profile will be presented.

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Thursday, April 7
10:45-12:00 noon

METABOLIC, THERMOREGULATORY, AND PSYCHOPHYSIOLOGICAL RESPONSES DURING ARM AND LEG EXERCISE. J.M. Pivarnik, T.R. Grafner, and E.S. Elkins, University of Houston.

The purpose of this investigation was to compare metabolic, thermoregulatory, and psychophysiological responses during upper and lower body exercise in different environmental conditions. Eight males performed four, 60 minute exercise bouts using either arm or leg ergometry in ambient temperatures of 23 (rh=75%) and 33 (rh=57%)°C. Power output was 75 watts for all experiments. Oxygen consumption ($\dot{V}O_2$), rectal (Tre) and skin (Tsk) temperatures, heart rate (HR), and perceived exertion (RPE) were measured during exercise. Exercise $\dot{V}O_2$ averaged 1.54 $l \cdot min^{-1}$ across all experiments and was equivalent to 60% of arm and 37% of leg peak values. Tre increased ($p<0.001$) an average of 0.43°C and did not differ due to experimental conditions. Exercise performed in the heat resulted in higher Tsk ($p<0.001$), regardless of whether the arms or legs were used. HR and RPE were greater ($p<0.001$) in arm (132.9 $b \cdot min^{-1}$, 14.4 units) than leg (108.9 $b \cdot min^{-1}$, 10.9 units) experiments. When arm exercise was performed in the heat, HR was 6 $b \cdot min^{-1}$ greater than when performed in the cool. Greater relative exercise intensity in arm work resulted in higher HR and RPE at the given power output. Similar Tre increases in all experiments indicate that core temperature is controlled by absolute heat production regardless of mode of exercise and ambient temperature.

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Thursday, April 7
2:00-3:15 p.m.

ASSOCIATION BETWEEN BODY STRUCTURE AND DISTANCE-RUNNING PERFORMANCE IN WELL-TRAINED MALE RUNNERS.

Don W. Morgan, Washington State University; Philip E. Martin and Fred D. Baldini, Arizona State University.

Running economy (RE), defined as the steady-state $\dot{V}O_2$ for a particular running speed, has been shown to explain a large and significant proportion of variation in distance-running performance among runners homogeneous on $\dot{V}O_2$ max. While various biomechanical, environmental, and metabolic factors have been identified as correlates of RE, little is known regarding the potential interrelationships among anthropometric characteristics, RE, and distance-running performance. To examine this issue, height (HT), body mass (M), leg length (LL), and trunk length (TrL) were measured on 12 male runners ($\bar{X}$ $\dot{V}O_2$ max=64.6 ± 2.0 ml/kg/min) who were assigned to a faster (A; n=6) or slower (B; n=6) group based on 10 km run time (RT). RE and stride length (SL) at 3 submaximal speeds (230, 248, and 268 m/min) were also determined from multiple treadmill tests. A significant correlation ($p<.05$) between RT and RE was found across groups. Group A runners displayed significantly better RT and RE, longer relative LL (LL/HT), and shorter relative TrL ([HT-LL]/HT) compared to Group B runners. At all speeds, a significant inverse relationship was observed between relative LL and relative SL (SL/LL), but no association was found between relative SL and RE. These data indicated that RE was related to distance-running success among well-trained male runners homogeneous on $\dot{V}O_2$ max. RE variation was not coupled to SL variation, but rather, may be associated with differences in relative LL and TrL. Although speculative, these results suggest that the association between RE and body structure variation is mediated to some extent by inertial characteristics and their potential effect on gait pattern. These data also support the need for cross-disciplinary research aimed at better understanding the single and combined influences of metabolic, structural, and mechanical factors on running performance.

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Thursday, April 7
2:00-3:15 p.m.

ACTUAL VS PREDICTED O_2 CONSUMPTION AND MET VALUES DURING A GRADED EXERCISE PROTOCOL. R.D. Liverman, L. Rath, D. Lyons, and S. Wideburg. Illinois State University.

When giving a graded exercise test, many hospitals estimate O_2 consumption and MET values rather than actually measuring them. The reasons for estimating may vary from lack of equipment to saving time. Whatever the reasons for estimating, the question of accuracy or applicability of the estimated values still exists. The purpose of this study was to determine any difference between O_2 consumption and MET values measured during a graded exercise protocol on the treadmill and values predicted by formulas. Fifteen males and fifteen females between the ages of 20 and 42 were tested on a treadmill using a modified Balke protocol. The subjects were tested between 6:30 a.m. and 8:30 a.m. prior to the ingestion of any food and before their daily routine. Resting heart rate and O_2 consumption values were measured in the sitting position just prior to starting the treadmill protocol. After a three minute warmup on the treadmill and a one minute standing recovery, the subjects walked at a speed of three miles per hour for two minutes each at 0, 2.5, 5.0, 7.5, 10.0 and 12.5 percent grades. Heart rate and O_2 consumption were measured with a Jaeger Ergo-oxyscreen during the exercise protocol. Estimated MET and O_2 consumption values were calculated by two different formulas, ACSM and Balke. The data were analyzed by the use of a MANOVA for repeated measures using a two-tailed test and the .05 level of significance. The statistical analysis revealed that for all the grade levels of the treadmill protocol the estimated O_2 consumption values were significantly higher than the measured values. The resting value of 3.1 ml/kg/min was also significantly lower than the standard value of 3.5 ml/kg/min. The estimated MET values were also significantly higher than the measured ones when using the average value for each grade level but were not significantly higher when using the peak values. The measured values for the males were not significantly different from those for the females. The results would indicate that the formulas used in this investigation are inaccurate and possibly inappropriate for estimating O_2 consumption values during a graded exercise protocol on the treadmill.

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Thursday, April 7
2:00-3:15 p.m.

ESTIMATING OXYGEN UPTAKE DURING FORWARD AND BACKWARD ACTIVITY. Susan Korchak and David Bacharach, Syracuse University

Backward activity otherwise known as retro activity is often incorporated in various sports in short spurts. More recently retro activity has been used to aid in injury rehabilitation. In some cases, retro activity has been shown to reduce low back and knee pain. With the use of retro activity increasing, there is need for determining cardiovascular responses to retro activity at different intensities. The purpose of this study was to compare oxygen uptake of forward treadmill walking and running to retro activity at the same speeds. A second purpose was to generate a regression equation that could estimate oxygen uptake of retro activity. Subjects (N=8) randomly completed eight 5 min. bouts of forward and backward activity on a treadmill at 2, 3, 4, and 5 mph. Each subject completed all trials using an intermittent protocol in which heart rate (HR) had to return to within 20% of their resting HR value prior to the next trial. Oxygen uptake was measured by open-circuit spirometry and HR was monitored with a Hewlett Packard electrocardiograph. Steady-state oxygen uptake for retro activity was significantly higher at 3, 4, and 5 mph. The linear regression equation for oxygen uptake in ml/kg min-1 for forward activity (y=-7.44 + 6.46x , r=.99) is in agreement with oxygen uptake data from a larger data base from Pollock, Wilmore, and Fox, (1978). The linear regression equation for retro activity (y=-7.05 + 9.16x, r=.96) suggests that the oxygen uptake for backward activity is approximately 5-10 ml/kg min-1 greater than for forward activity at the same speed. When these measures of oxygen uptake are translated into METs, a range of 1.5-2.9 METs can provide a sound basis for prescribing an appropriate intensity for using retro activity as a suppliment to forward activity training.

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Thursday, April 7
2:00-3:15 p.m.

EFFECTS OF VARYING DOSES OF ORAL SMOKELESS TOBACCO (OST) DURING PROGRESSIVE EXERCISE TO MAXIMAL AEROBIC POWER. Fred D. Baldini, Andrew W. Gardner, James S. Skinner, Lloyd G. Bodle, Christine R. Reece, and Daniel M. Landers, Arizona State University.

The use of OST by athletes has increased as they believe that it enhances performance, even though its effects on athletic performance are not known. The purpose of this study was to determine the effects of varying doses of OST on oxygen uptake (VO2) and on the onset of 4mM blood lactate accumulation (OBLA) during progressive exercise to VO2 Max. The mean dose taken by 11 male OST users was determined and responses to 4 individualized dose conditions were studied (zero,1/3 mean,mean,and mean + 2/3 dose) on 4 separate days and in a random order as each subject performed a progressive bicycle ergometer test to VO2 Max. Before testing, subjects abstained from OST and caffeine for at least 10 hr. Prior to each test, subjects took the dose for that day, discarding it after 10 min. They then cycled at a power output (PO) of 59 W and PO increased 29 W every 3 min to exhaustion. Blood lactate was measured after each PO until OBLA was reached. After exhaustion, subjects rested 6 min and then exercised 2 min at a submaximal PO and 2 min at a supramaximal PO that was 29 W above that achieved during the progressive test. Based on these 2 tests, all subjects achieved VO2 Max. The following table lists the means and standard deviations for the variables analyzed using a one-factor ANOVA with repeated measures:

	ZERO	1/3 MEAN	MEAN	MEAN + 2/3
VO2 Max	39.2 ±5.5	40.2 ±5.0	39.6 ±5.9	39.7 ±5.3
VO2 at OBLA	28.1 ±3.7	31.2 ±4.6**	30.2 ±6.0	29.9 ±4.7
PO at OBLA	158 ±25	174 ±21	168 ±28	168 ±31
%VO2 Max	72.4 ±7.2	77.4 ±5.4	76.0 ±6.2	75.4 ±6.8

(**$p<0.05$, VO2 reported in $ml.kg^{-1}.min^{-1}$, PO in Watts)

There was no significant difference in VO2 Max at various doses of OST but there was a significant difference between the zero dose and the 1/3 mean dose conditions for the VO2 at OBLA. A general trend for OBLA to be delayed was found in all OST dose conditions. We conclude that maximal aerobic power is not influenced by OST use. We recently showed that brief, high-intensity exercise was also unaffected by varying OST doses. There does appear to be some effect on OBLA, possibly due to an increased release of free fatty acids resulting from nicotine stimulation. The possible changes in substrate utilization during exercise while under the influence of OST needs further study.

(Paritally supported by the U.S. Tobacco Company)

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Thursday, April 7
2:00-3:15 p.m.

CARDIOVASCULAR EFFECTS OF PLASMA VOLUME EXPANSION. Mari H. Hopper, Kansas State University; E.F. Coyle, University of Texas.

Plasma volume rapidly increases in response to exercise training (Convertino, 1980; Green, 1984; McKeever, 1987). Results from a previous investigation (Hopper et al., in press) indicate that this increase in plasma volume may significantly contribute to the increase in stroke volume that occurs in response to exercise training. Increasing plasma volume by intravenously infusing 403 ± 21 ml of a 6% dextran solution prior to cycling exercise increased stroke volume 11% (i.e. 130 ± 6 to 144 ± 5 ml; $P < 0.05$) in untrained men (n=7). Stroke volume was measured using CO_2 rebreathing. Six separate determinations of stroke volume were obtained for each subject and the mean value reported. The extent of plasma volume expansion selected for infusion approximated the increase in plasma volume reported to occur in response to short term exercise training (Convertino, 1980; Green, 1984). In addition, further plasma volume expansion (i.e. 706 ± 43 ml) did not result in a further increase in stroke volume (i.e. 145 ± 4 ml). Based upon the discovery that exercise stroke volume could be significantly increased by increasing plasma volume, the purpose of this study was to determine the mechanisms involved. The methods required were not feasible for human subjects; therefore, horses were utilized (n=5). Mean right atrial pressure (RAP), or central venous pressure, was measured by placing a Millar pressure transducer into the right atrium. Heart rate was obtained by placing electrocardiographic leads on the forehead, left wither and sternum. At rest, mean RAP significantly correlated with plasma volume ($r = .93$; $P < 0.05$). Intravenous infusion of 4,500 ± 55 ml of a 6% Dextran solution prior to exercise increased mean RAP by 315% (2.0 ± 2 to 8.3 ± 3 mmHg; $P < 0.05$). Resting heart rate declined from 49 ± 5 to 37 ± 7 beats per minute. During submaximal exercise (running on the treadmill at 7 m/s; 0% grade) mean RAP was also significantly elevated following plasma volume expansion (10.9 ± 3 to 24.6 ± 8 mmHg; $P < 0.05$). Heart rate at this work rate decreased from 170 ± to 161 ± 12. These data, coupled with the results of the previous investigation, suggest that exercise stroke volume is preload dependent and that preload is increased by increasing blood volume.

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Thursday, April 7
2:00-3:15 p.m.

CHANGES IN SERUM LIPOPROTEINS AND LIPOPROTEIN SUBSPECIES IN RABBITS WITH EXERCISE. R. Carl Westerfield, The University of Alabama.

Research studies have provided evidence of the relationship between levels of serum lipoproteins and cardiovascular disease (CVD). Recent epidemiological data and research studies indicate that the subspecies of low density (LDL) and high density (HDL) lipoproteins are important in CVD risk. Studies indicate the subspecies HDL_2 provides a greater protection from CVD than does HDL_3, and that the LDL subspecies of intermediate density lipoprotein (IDL) and medium density (MDL or Lp[a]) are significantly associated with CVD. The purpose of this study was to determine the effects of a moderate aerobic exercise program on serum lipid levels in rabbits. Forty New Zealand White Rabbits were randomly assigned to exercise or non-exercise groups. The exercise group received daily aerobic exercise on an animal treadmill for 180 days. Serum samples were obtained every 30 days throughout the study. Lipid profiles and levels (MG%) were determined through the Vertical Spin Auto Profiler (VAP) method. Statistical analysis indicated the exercise group had significantly ($P<.05$) lower mean values for: LDL, Lp(a), LDL/HDL ratio, HDL_3, and HDL_3/HDL_2 ratio. The exercise group had significantly higher HDL_2 levels. There were no significant differences between the exercise and non-exercise groups in HDL, VLDL, or IDL. The findings support the positive role exercise has in producing changes in certain serum lipoprotein and lipoprotein subspecies.

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Thursday, April 7
2:00-3:15 p.m.

TEMPERATURE GRADIENTS AND HEAT DISSIPATION CONFIGURATIONS OF AIR BLADDER FOOTBALL HELMETS. Mark W. Maneval, James B. Gallaspy, Walter R. Thompson, Charles N. Wilkes, James T. Johnson, Charles R. Brent, George T. Crook, John G. Lamberth, Kent D. Johnson, Stan P. Brown, University of Southern Mississippi.

The purpose of this investigation was to measure the temperature gradients and heat dissipation configurations of air bladder type football helmets (ABFH). It was hypothesized that the new style ABFH, in compliance with vigorous safety standards that mandate additional impact absorbing pads and bladders may inadvertently create a poor micro-environment in which to dissipate cranial heat. Eight varsity football players volunteered to exercise at 70% of their $\dot{V}O_2$ max, as measured by a standard bicycle ergometer protocol for thirty minutes. The work bout took place in a controlled environmental chamber. Air temperature (AT) ($\bar{X}$ = 36.9°C), relative humidity (RH) ($\bar{X}$ = 96%) and solar radiation (SR) ($\bar{X}$ = .5029 watts/cm^2) were created to replicate a typical August afternoon practice session in the southern region of the United States (Lat. 31.5°N). Rectal core temperature (RCT), helmet skin temperature (HST) and helmet air temperature (HAT) were monitored every 2 minutes by three separate YSI 400/405 temperature probes interfaced with a digital YSI 2100 tele-thermometer. Data were analyzed using repeated measures analysis of covariance (ANCOVA). While statistically controlling for initial temperatures, RCT, HST, and HAT increased significantly ($p \leq .05$) across the 15 two-minute ergometer time intervals. HST leveled off during the last eight minutes of the 30-minute exercise bout (37.27°C). Both RCT and HAT continued to increase significantly across time ($p \leq .05$). Consequently, the data suggest that normal skin temperature regulatory mechanisms allow for the dissipation of collected HST. The ability to dissipate cranial heat is not evident due to the increased HAT. The basic recommendation would be to allow the athlete to remove the ABFH periodically to dissipate accumulated heat thus enhancing a more favorable temperature gradient between RCT and HAT.

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Thursday, April 7
2:00-3:15 p.m.

A THREE-YEAR FOLLOWUP TO AEROBIC TRAINING OF BLACK WOMEN.

Edwyna P. Testerman, University of Southwestern Louisiana; Ron J. Byrd, Louisiana State University; Paula S. Williams, University of Southwestern Louisiana; Denis F. Tallini, Our Lady of Lourdes Hospital, Lafayette, Louisiana.

The purpose of this study was to determine the degree to which a group of 17 middle-aged (Mean = 40.1 yrs.) black women maintained the level of fitness developed in a 12-week program of aerobic walking/jogging activity and to relate these data to subjects' reported perception of level of continued activity over a subsequent period of three years. Criteria were body weight, sum of three skinfolds (triceps, suprailium, and thigh), heart rate at rest by ECG and blood pressure at rest by standard auscultatory methods, heart rate and blood pressure during the last minute of the Astrand cycle test, and the pressure-pulse product during the standardized exercise. Eight subjects reported perception of being involved in more regular activity since the formal training, five indicated that they believed that they had continued at about the same level and intensity, and four revealed a pattern of continued, but lesser activity over the three years after the training. ANOVA on the total group and on a subgroup of ten which had reported for an interim testing one year after termination of formal training revealed significant reductions in resting heart rate only in the group that supposedly had continued at a higher level of training, and lower pressure-pulse products in both the higher and same-level groups. The latter change was a result of a significant drop in exercise heart rate in the ANOVA over three tests, and from a significantly lower exercise systolic blood pressure in the ANOVA on baseline and 3rd year data. Although no changes occurred in body weight, sum of skinfolds, or resting blood pressures after the formal training ended, it was concluded that the training was efficacious in that a majority of the subjects continued to exercise to a degree such that pressure-pulse product, an indicant of myocardial oxygen consumption, was significantly lowered three years later. Further, it was concluded that the subjects were reasonably accurate in their assessment of followup physical activity.

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Thursday, April 7
2:00-3:15 p.m.

PHYSIOLOGIC COMPARISON OF TWO INTERVAL TRAINING REGIMENS USING A COMPUTERIZED STATIONARY CYCLE. S. Wilkie, A. Ward, D. Parker, S. O'Hanley, M. Hagan, K. Bertagnoli, J. Rippe, Department of Medicine, University of Massachusetts Medical Center, Worcester, MA 01605

This study compared the physiologic effects of 2 interval training programs using the Lifecycle Aerobic Trainer. Females were randomly assigned to either progressive, interval hill profile (HILL) (n=8, x±SD age, Ht, and Wt=32.6±4.7 yrs, 161.4±4.8cm, and 68.7±12.1 kg), or standard interval program (INT) (n=13, x±SD age Ht, Wt = 28.0±2.4 yrs, 161.6±5.7 cm, and 61.7±10.4 kg). Nine females (x±SD age, Ht and Wt=31.5+5.1 yrs, 164.1±4.0cm, and 61.4±14.5 kg) volunteered as control subjects (CONT). VO_2 max was measured during a maximal cycle ergometer test twice prior to and twice following the training program. The highest VO_2 max values before and after training were compared. Percent body fat was estimated by skinfold measurements. Subjects trained in a supervised program 24min/day, 3 days/wk for 12 weeks at 75-90% HR reserve. Energy expenditure was equalized for the two training groups (HILL=575.5±38.6 kcal/wk, INT=573.7±34.9 kcal/wk). ANOVA with repeated measures and Newman-Keuls analysis were used to test for significant changes. There were no differences among groups pre-training and body weight did not change during the training period. The results for VO_2 max (ml/kg/min) and % body fat are:

	VO_2 max		% Body Fat	
Group	Pre	Post	Pre	Post
HILL	28.4±7.0	35.3±7.1*	30.3+9.8	28.2+8.8*
INT	31.2±4.8	38.3±5.3*	27.0+6.0	25.7±5.5*
CONT	30.5+4.7	31.4+5.5	23.1+7.6	23.3+7.7

*p<.05, pre to post

With energy expenditure equalized the HILL and INT groups had significant and similiar improvements in VO_2 max and % body fat during the 12-week training program. Conclusion: both progressive interval hill profile and standard interval training programs on a Lifecycle are highly effective for improving VO_2max and decreasing body fat.

Supported by a grant from Life Fitness

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AN ALTERNATIVE PROTOCOL TO THE BRUCE TREADMILL TEST FOR YOUNG TRAINED ADULT MALES. T.E. Ward, B.C. McKeown, C.L. Hart, S. A. Zinkgraf. University of Texas-Arlington and Southwest Texas State University.

The graded exercise test (GXT) is a vehicle which provides for the assessment of one's functional capacity. This functional capacity is primarily based on the peak oxygen requirement (VO_2) attained during the highest workload. However, the VO_2 is often estimated rather than directly measured with a possible "gray area" existing between the speeds of 100 m/min and 134 m/min. A problem peculiar to the Bruce Treadmill test is the varying speeds at each stage leading to possible performance difficulties. Particularly, the 112.6 m/min speed during the fourth stage, in which the subject must decide to walk or run, may lead to inaccurate VO_2 estimates. The effects of varying treadmill protocols (TM) were studied in 17 trained healthy males (age: $\bar{X}$=32.3±6.4 yrs; range=25 to 44 yrs). Each subject performed three randomly ordered graded exercise tests (GXT) to exhaustion as follows: 1) Bruce TM with the subject running the 4th stage (TM Run); 2) Bruce TM with the subject walking the 4th stage (TM Walk); and 3) a theoretically metabolically equivalent TM with the first 3 stages performed at 91.2 m/min on 2, 8 and 14% grades, respectively, and the 4th stage velocity increased to 134.1 m/min on the 14% grade (TM Mod). During each GXT, submaximal and maximal HR, BP, Ve, VO_2 (l/min and ml/kg/min) were monitored as well as maximal TM time. Utilizing a repeated measures ANOVA, no significant ($p<.05$) differences were found among the three protocols for any of the maximal measures. Intra-individual correlations coefficients between TMs ranged from 0.74 to 0.81 (absolute peak VO_2) and .69 to .74 (relative peak VO_2). Similar results were found on submaximal values. In analyzing the results, the random ordering of the tests seemed to alleviate a possible learning effect. Further, the within subject variability of max absolute and relative VO_2 values averaged 5%, which would seem acceptable. The VO_2 correlations were somewhat lower than anticipated (r=.90). However, the correlations between TM Mod and the two other TM's (r's=.69 to .78) were similar to the correlates between the TM Walk and TM Run (r's=.75 and .81). Based on the results and the subject's dilemma of selecting walking or running as a mode during the fourth stage of Bruce TM, it is concluded that the new protocol with fewer speed changes could be used as an alternative to the Bruce TM when testing young trained males.

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Thursday, April 7
2:00-3:15 p.m.

HYDROSTATIC WEIGHING WITHOUT HEAD SUBMERSION WITH OBESE FEMALES. Thomas N. Fennessey, Joseph E. Donnelly, Dennis J. Jacobsen, Kearney State College, Kearney, NE.

Hydrostatic weighing without head submersion performed at total lung capacity (HW at TLCNS) may provide an alternative HW method for populations that frequently do not tolerate submersion. Sixty-eight obese females (42.3 $\pm$ 6.5% fat) performed 10 trials of HW at residual volume (RV) and 5 trials of HW at TLCNS with the order of HW method selected randomly. RV was determined in duplicate by oxygen dilution. Vital capacity was determined with the subject submerged to the shoulders. Total lung capacity was calculated as RV + VC. Fifty subjects were randomly assigned to the experimental group (E) and the remaining 18 subjects were assigned to the validation group (V). Linear regression was performed with E group data with body density (Db) from HW at RV as the dependent variable and Db from HW at TLCNS as the independent variable ($y = 0.6075 * DbHW$ at TLCNS + 0.3622; SEE = 0.0054). Db from HW at RV and Db predicted from HW at TLCNS from V_2group data showed mean difference = 0.0010, $r = 0.91$, $R^2 = 0.83$, SEE = 0.0047, E = 0.0047. These results suggest that HW at TLCNS is an alternative procedure for obese females that do not tolerate HW at RV.

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Thursday, April 7
2:00-3:15 p.m.

DELAYED ONSET MUSCULAR SORENESS FOLLOWING LOW IMPACT AND HIGH IMPACT AEROBIC DANCE. Lynn A. Darby, School of HPER, Robert Harr, Dept. of Medical Technology, Laurie Bell, School of HPER, Bowling Green State University, Bowling Green, OH 43403; Roberta L. Pohlman, Div. of HPR, Wright State University, Dayton, OH 45435

Delayed onset muscular soreness (DOMS) was evaluated in 13 college age women following 20 minutes of either low impact (LO;n=6) or high impact (HI;n=7) aerobic dance. Low impact aerobic dance has been suggested as a means of reducing injuries, especially in beginners to aerobic dance participation. DOMS was assessed by measuring serum levels of creatine phosphokinase, [CPK], aspartate aminotransferase, [AST], and lactate dehydrogenase, [LDH], immediately following exercise, and 24 and 48 hours postexercise, T_0, T_{24}, and T_{48}, respectively. Blood levels of these enzymes usually peak 48 hours postexercise and signal muscular damage. Comparisons among groups and times of collections were done using between-within ANOVAs and Neuman-Keuls post hoc tests when appropriate. When the HI and LO groups were compared at the same time intervals, there were no significant differences for [CPK], [AST], [LDH], or lactic acid [LA].

	T_0		T_{48}	
	HI	LO	HI	LO
[CPK]*	65.00±15.05**	68.29±9.30	63.00±14.20	49.43±6.29
[AST]	39.83± 4.24	25.14±2.74	24.33± 1.23	21.71±2.18
[LDH]	77.17± 3.59	77.71±3.56	74.83± 4.61	65.71±2.38
[LA]	4.33± 0.73	2.01±0.37	1.11± 0.09	1.00±0.21

* All values in IU/L except [LA] which is in mmol/L.

** $\bar{X}$±SEM. T_{24} is not shown.

[LDH] and [AST] were significantly different at various times of collections, but these differences could be explained by normal physiological variations. HI [LA] at T_0 was significantly greater than T_{48} and T_0 concentrations would be comparable to a submaximal level of exercise. Total hemoglobins and percentage body fat determined using the underwater weighing method were within normal ranges and were not significantly different between the groups. Mean heart rates for minutes 18-20 for HI ($\bar{X}$±SEM=180.7±6.3) were significantly greater than LO ($\bar{X}$±SEM=161.3±5.5). If beginning college age exercisers adhere to current exercise guidelines for training heart rate and gradual progression, HI aerobic dance should not induce greater delayed onset muscular soreness than LO aerobic dance.

Supported by a BGSU Faculty Research Committee Basic Grant

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Thursday, April 7
2:00-3:15 p.m.

EFFECTS OF REGULAR EXERCISE ON PHYSIOLOGICAL AND PSYCHOLOGICAL STATUS OF ADULTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE.

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The physiological effects of regular aerobic exercise were assessed in six men and six women, 46-71 years of age with chronic obstructive pulmonary disease (COPD). Maximal aerobic capacity (treadmill), pulmonary function, knee and shoulder flexion/extension, blood chemistry and CBC were measured prior to (T1) and following 14 (T2) and 28 (T3) weeks of aerobic exercise. The program consisted of stretching exercises before and after 30 minutes of intermittent walking. The control group (C) began the exercise program after T2. An additional 3 men were included in the experimental 28-week group (E) for assessment of the additional psychological effects: state-trait anxiety (Spielberger), depression (Zung), and self-esteem (Jaeger). Mean oxygen uptake was 11.0 - 14.3 ml.kg-1.min-1 and tests of pulmonary function remained below 70% predicted. No significant changes ($p<0.05$) were observed on any physiological variable except for a striking increase in walk time on treadmill (361.8 $\pm$ 197.0 sec. E and 452.8 $\pm$ 330.5 sec. C on T1 vs 561.0 $\pm$ 478.7 sec. E and 549.5 $\pm$ 493.5 sec. C) in seven subjects by T3. Mean trait anxiety was consistently reduced. The assessment procedures did not induce change of state anxiety at any test session. Mean levels of depression remained stable throughout. Subjective data reflect increased positive feelings toward exercise. Confounding the results are a small sample size, subject mortality at T3, and great inter-subject variability of COPD patients. The results of this interdisciplinary study indicate a greater tolerance for exercise combined with reduced trait anxiety and increased perception of well-being. Yet little or no change in other psychological variables or physiological status, apart from treadmill stamina, occurred as a result of long-duration aerobic exercise.

Funded by University of North Carolina at Greensboro Research Council; American Lung Association of NC, Piedmont Region; and Wesley Long Community Hospital, Greensboro, NC.

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Thursday, April 7
2:00-3:15 p.m.

DIFFERENTIAL TRAINING-INDUCED CHANGES IN LEG MUSCULARITY. Larry Weiss, Memphis State University; Harvey Coney, Georgia Southern College; Frank Clark, University of Tennessee, Memphis.

This study was designed to compare the effects of low, moderate, and high repetition heavy-resistance training on leg muscularity. Subjects were 38 young, untrained men. Following four pretraining sessions, pretests were administered for the variables body weight, thigh girth, thigh net girth, and ultrasonically-determined quadriceps femoris and hamstring muscle thicknesses. Subjects were randomly assigned to one of three exercise groups or to a nonexercising control group. For 7 weeks, 3 days per week, each exercise group completed one of the following training routines: Group I, 4 x 3-5 repetitions maximum (RM); Group II, 4 x 13-15 RM; Group III, 4 x 23-25 RM. Group IV served as the control. A one-way ANOVA was used to compare changes in performance by the four groups. A Tukey multiple comparison test was applied when appropriate. Results of the study were equivocal. No significant differences ($p > .05$) were found between any of the four groups for body weight and hamstring thickness. Thigh girth increased significantly ($p < .05$) only in Group III as compared to the control group. Thigh net girth increased significantly ($p < .01$) in Groups II and III as compared to the control group. Quadriceps femoris thickness increased significantly ($p < .01$) in all three training groups as compared to the control group. These results indicate that the three weight training programs will elicit differential changes in upper leg muscularity depending upon how it is measured. Conclusions, therefore, must also be made in light of the testing instrument used. Participation by young men in 7 weeks of either low, moderate, or high repetition heavy-resistance training will not affect body weight or hamstring thickness. High-repetition training elicits the largest increase in thigh girth, while medium and high repetition programs bring about the greatest increase in thigh net girth. Finally, low, medium and high repetition programs will bring about similar significant increases in quadriceps femoris muscle thickness.

This project was supported by the Department of Radiology at Bulloch Memorial Hospital, Statesboro, GA. The assistance provided by Dr. Cerillo Aseron, Dr. Donald Connell and Mrs. Linda Tinker are gratefully acknowledged.

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Thursday, April 7
2:00-3:15 p.m.

A physiological comparison of female body builders and power lifters. GO Johnson, TJ Housh, DR Powell & CJ Ansorge. Center for Youth Fitness and Sports Research, University of Nebraska-Lincoln.

Ten female body builders (FBB) ($\bar{X}$ age $\pm$ SD = 30.4 $\pm$ 8.22 years) and ten female power lifters (FPL) ($\bar{X}$ age $\pm$ SP = 25.2 $\pm$ 6.01 years) were studied to determine group differences in body composition) anaerobic characteristics and strength. All subjects had been training a minimum of two years and twelve of the subjects had competed nationally while the remainder had participated in regional or local events. Measures of body build and body composition were obtained via hydrostatic weighing, skinfolds (sum of 7), circumferences (sum of 13) and diameters (sum of 9). Flexion and extension strength of the dominant forearm and leg were measured with a Cybex II dynamometer at 60°/second. Anaerobic power and capacity were determined using the Wingate Anaerobic Test. Independent t-tests indicated that FPL had significantly greater body weight ($\bar{X} \pm$ SD = 68.60 $\pm$ 3.60 vs 56.47 $\pm$ 0.85 kgs), relative fat (21.47 $\pm$ 1.29 vs 13.51 $\pm$ 1.46 %), sum of skinfolds (120.76 $\pm$ 7.55 vs 71.46 $\pm$ 7.02 mm), sum of diameters (177.57 $\pm$ 2.97 vs 168.17 $\pm$ 2.55 cm), and sum of circumferences (594.93 $\pm$ 13.10 vs 551.24 $\pm$ 3.17 cm) as well as higher endomorphic ratings (8.23 $\pm$ 0.28 vs 5.80 $\pm$ 0.45) and lower ectomorphic ratings (1.20 $\pm$ 0.43 vs 3.12 $\pm$ 0.32) than the FBB. No significant differences were found for fat-free weight, strength or anaerobic power and capacity. These results demonstrate subtle but specific differences between well-trained FBB and FPL reflecting the leaner physiques and smaller skeletal structures of the FBB necessary for the definition and symmetry demanded by the sport. Lack of differences in strength and anaerobic characteristics reflect the similarity of the groups in basic training techniques.

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Thursday, April 7
2:00-3:15 p.m.

Electromyographic activity, EMG mean frequency, and force production parameter changes with isokinetic strength training.
Richard Engelhorn, Iowa State University.

Gains in muscular strength due to weight training reflect the contribution of both hypertrophic and neural components. Previous research has investigated the interaction of neural and hypertrophic contributions using both muscular torque and integrated EMG activity measures in trained and untrained muscles without attempting to assess recruitment or rate coding pattern modifications that may occur with improvements in strength. It was the purpose of this research to use EMG mean frequency parameters as well as EMG activity and muscular torque measures to provide insight into the patterns of change in muscular force production, especially those related to the differential use of the motor units within a muscle as a result of strength training. Fourteen volunteer subjects, six men and eight women (ages 20-24), were randomly assigned to experimental and control groups. None of the subjects had been involved in strength training during the previous three months. The experimental group trained three times per week for ten weeks on a CYBEX isokinetic device at 60 degrees per second using right arm elbow flexion. Subjects were tested before and after the ten week training program with subjects performing three maximal trials on the CYBEX system during which EMG activity was recorded using bipolar surface electrodes. Dependent variables measured were integrated EMG activity and EMG mean frequency parameters from the biceps brachii muscle, and isometric and dynamic muscular torque parameters measured on both trained right arms and untrained left arms. Analyses of variance (group by arm by movement type by testing time) performed on the peak torque and the time to peak torque for both isometric and dynamic tasks revealed that the trained subjects improved their force production in both the trained and untrained arms ($p < .05$), with the largest changes occurring in the trained arm. Results of ANOVA's performed on the EMG activity and mean frequency data also indicated differences related to training, the type of movement (isometric versus dynamic), and the arm used for the task performance. Observed increases in mean frequency over the training period, coupled with the EMG activity results, suggest that training resulted in a modification in the control and/or recruitment of motor units in the biceps muscle of both the trained and untrained limbs.

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Thursday, April 7
2:00-3:15 p.m.

MAXIMAL POWER OUTPUT IN MALES AND FEMALES AT FIVE ERGOMETRIC WORKLOADS. Cathy Dooly-Manning, St. Joseph's Hospital; James M. Manning, William Paterson College.

The purpose of this study was to determine maximal power output in males and females using the recommended Wingate Protocol (75 g/kg of body weight) as well as four resistances above this. It was hypothesized that absolute and relative peak power (PP) and mean power (MP) would not be the same at the five resistances chosen. A second purpose was to investigate the differences of these five resistances between males and females. Fourteen male (mean age, 20.8 yrs; mean height, 173.2 cm; mean weight, 68.0 kg) and 16 female (mean age, 22.1 yrs; mean height, 163.4 cm; mean weight, 57.0 kg) physical education majors volunteered to take part in the study following informed consent. Each subject performed the Wingate Protocol at each of the following resistances on a Monark bicycle ergometer: 75, 82, 89, 96, and 100 g/kg of body weight. The test order was randomized and each test was spaced by at least 24 hours. ANOVA for absolute and relative power resulted in a significant F ($p < .05$) between males and females. Further post-hoc analyses using Duncan's Multiple Range Test revealed that males were significantly different from females at all resistances for absolute and relative peak and mean power. In addition, none of these power indicies were shown to be significantly different when analyzed separately for males or females. It was concluded that the assignment of greater resistance loads does not produce significantly different power outputs than the recommended Wingate Protocol of 75 g/kg of body weight in males or in females, however, males were able to generate more power than females at each respective resistance load used.

	75g	82g	89g	96g	100g	F
PP (watts)						
males	695.1 ±113.5	699.2 ±112.1	697.1 ±126.4	734.2 ±153.7	731.0 ±109.7	36.38*
females	426.3 ±59.9	430.8 ±46.1	425.0 ±59.7	444.2 ±49.7	445.6 ±61.9	
PP (w/kg)						
males	10.2 ±.9	10.3 ±1.2	10.2 ±1.3	10.7 ±1.5	10.7 ±1.0	28.55*
females	7.5 ±.9	7.6 ±.8	7.5 ±1.1	7.8 ±.8	7.8 ±1.1	
MP (watts)						
males	559.0 ±83.4	572.7 ±97.3	575.6 ±80.8	589.4 ±103.3	583.9 ±81.6	43.96*
females	355.5 ±38.5	358.0 ±34.0	359.6 ±41.1	352.5 ±39.1	359.0 ±41.9	
MP (w/kg)						
males	8.1 ±.6	8.4 ±.9	8.5 ±.7	8.6 ±.9	8.6 ±.8	38.44*
females	6.2 ±.5	6.3 ±.6	6.3 ±.7	6.2 ±.7	6.3 ±.7	

*p<0.05

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Thursday, April 7
2:00-3:15 p.m.

EXERCISE INTENSITY AND DEPTH OF FATIGUE RELATED TO MUSCLE FIBER TYPES OF POWER AND ENDURANCE TRAINED ATHLETES. N. Jean Lambert, Walter Kroll, and Priscilla Clarkson; University of Massachusetts.

Exercise intensity versus the depth of fatigue were related to muscle fiber types of power trained (PT; n=6) and endurance trained (ET; n=6) athletes. Three maximal voluntary contractions (MVC) of the knee extensors were assessed over 4 days. On days 2 - 4, subjects performed three bouts of holding times (HT) at one of three intensities, each followed by a post-bout MVC. Exercise intensities were three HT's to fatigue at 30, 50, and 80% of the subjects pre-determined MVC. Decreased HT and % strength loss (%SL) were used as criteria for depth of fatigue. Biopsies were obtained from the vastus lateralis of 7 subjects (PT n=3, ET n=4) during Day 5 for analysis of fast twitch (FT) and slow twitch (ST) muscle fiber properties. Statistical comparisons included a 3-factor REANOVA, Intraclass R and Pearson r. Results indicated that baseline MVC's were stable and reliable (R=.97) for both groups over the 4 test days. MVC's were 62% greater for the PT than the ET group ($p<.01$). HT's were longer at the lower exercise intensities ($p<.01$), and HT's for the ET group were longer than for the PT group ($p<.01$). The ET group showed a greater absolute and relative decrease in HT over bouts than the PT group ($p<.01$). Greater decreases in HT's over bouts occurred at lower exercise intensities ($p<.05$). %SL from baseline MVC was greater at the lower exercise intensities ($p<.01$). There were no differences between post-bout MVC's. A greater absolute, but not relative, strength loss occurred for the PT than for the ET group at each exercise intensity. Comparisons of HT, %SL, MVC and muscle fiber properties revealed correlations between: HT at 50 and 80% MVC (r=.83), %SL at 50 and 80% MVC (r=.86), HT at 30% MVC and the ratio of a single FT fiber to single ST fiber area (r=-.80), and MVC and single FT fiber area (r=.78). It was concluded that lower exercise intensity produces greater depth of fatigue; however, factors contributing to the depth of fatigue differ for the various exercise intensities, relative to the criteria and group examined.

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Thursday, April 7
2:00-3:15 p.m.

USE OF THE POWERCAM TORQUE MODIFIER FOR BICYCLE FRONT CHAIN WHEELS: IMPLICATIONS FOR TRIATHELTE COMPETITION. Peter J. Maud, Eastern Washington University, Glenn Stokes, Columbus College, Donna Shannon and Walton Curl, Hughston Sports Medicine Foundation.

Use of the Powercam*, a cam-governed torque modification for bicycle front chain wheels designed to allow efficient use of high gear with low rpm, has been claimed to allow the triathlete to "race faster, recover quicker and run better". (Powercam. The High Gear Revolution*) The purpose of this study was to evalutate the effects of Powercam (PC) use on oxygen uptake (VO2), heart rate (HR) and perceived exertion (RPE, Borg Scale) during bicycle riding and post-ride running. Six male, volunteer, triathletes, mean age 34 years, were tested on a Windtamer* bicycle mounted on a Road Machine*. Two tests were administered, one with PC using high gear/low rpm and one without PC (NPC) using low gear/high rpm where rear wheel speed, and thus power output, was identical. Exercise intensity during both ride and run was dependent upon individual fitness level. (PC $\bar{x}$=60 rpm @ 128 gear ins, NPC $\bar{x}$=92 rpm @ 85 gear ins, treadmill speed $\bar{x}$=7.5 mph). Prior to testing ss were given experience both with the PC and metabolic data collection equipment. The test protocol consisted of a 20 min ride, a one min transition period and immediately succeeded by the 15 min treadmill run. HR and VO2 were monitored continuously with data from the last 15 minutes of the ride and all 15 minutes of the run used for comparison purposes. Perceived exertion was obtained at 5 min intervals. A paired t-test was used to compare between conditions. Mean test results were:

	Ride			Run		
	VO2 (ml/kg.min)	HR (bpm)	RPE (score)	VO2 (ml/kg.min)	HR (bpm)	RPE (score)
PC	38.8	142	11.2#	48.8	159	12.0
NPC	41.6	145	12.0#	49.1	161	11.5

No significant differences were found ($p>.05$) between conditions for either HR or VO2 during either the ride or the run, nor was it found for RPE during the run. However, RPE was significantly different ($p<.01$) during the ride. The results of this study seem to indicate that under the specific conditions of these tests the PC was not effective in enhancing performance either during the ride or during the run that followed. However, riding with the PC was perceived as a less demanding condition.

*Powercam - Houdaille, Inc., 2410 Minnis Drive - 120, Fort Worth, TX 76117.
# $p<.01$

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Thursday, April 7
2:00-3:15 p.m.

Relative Left Ventricular Hypertrophy Indices In Weight Lifters. Stanley P. Brown & Walter R. Thompson, Laboratory of Applied Physiology, Department of Physical Education, University of Southern Mississippi, Hattiesburg MS, 39406.

Central and peripheral circulatory adjustments consequent to weight training has been of interest to sport scientists. This research sought to investigate the type of cardiac hypertrophy produced by weight training, and if this hypertrophy is clinically similar to that seen in the pathologic course of hypertension. The cross-sectional study matched 7 sedentary men with 12 male weight lifters ($\bar{x}$ age = 26.3 yrs vs 22.7; $\bar{x}$ WT= 79.8 Kg vs 86.2; $\bar{x}$ BSA = 1.87 m^2 vs 1.99; and $\bar{x}$ LBM = 70.6 Kg vs 66.9, respectively). These important biometric variables were statistically controlled. Resting left ventricular functional characteristics and the degree and variety of cardiac hypertrophy were evaluated by M-mode echocardiography in a standardized 30 degree decubitus position. LBM was evaluated by hydrostatic weighing. Left ventricular volumetric and dimensional characteristics taken as absolute measures were similar between groups. The following data demonstrate a "true" relative hypertrophy in the weight lifters with respect to BSA and WT:

	WL	Controls	P Value
LVEDD (cm/m^2)	2.91 ± 0.12	2.72 ± 0.14	0.01
LVPWT (cm/m^2)	0.50 ± 0.05	0.45 ± 0.05	0.05
LVPWT ($cm/kg \times 10^{-2}$)	1.17 ± 0.10	1.04 ± 0.11	0.05

LVEDD = left ventricular end-diastolic dimension; LVPWT = left ventricular posterior wall thickness. Since the wall thickness-to-radius ratio (w/r) was similar (WL = 0.34 ± 0.026 vs controls = 0.33 ± 0.032) the presence of a small degree of relative ventricular hypertrophy was interpreted to be dissimilar to the concentric hypertrophy demonstrated in the course of hypertension.

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Thursday, April 7
2:00-3:15 p.m.

RELATIONSHIP OF AEROBIC AND ANAEROBIC POWER/CAPACITY IN MALES AND FEMALES, Nancy Kay Butts, Department of Physical Education, University of Wisconsin - LaCrosse, LaCrosse, WI.

Aerobic and anaerobic performances in males (n=16) and females (n=25) were examined. Aerobic power was obtained on a cycle ergometer test and expressed in absolute ($AMVO_2$: $L \cdot min^{-1}$) and relative ($RMVO_2$: $ml \cdot kg \cdot min^{-1}$) values. An "all-out" 30 sec anaerobic test was completed at resistances of 1.0 and 0.9 $N \cdot kg^{-1}$ for males and females, respectively. Peak power output during the first 5 sec was expressed in both absolute (PAP: W) and relative (PRP: $W \cdot kgBW^{-1}$) values as were total 30-sec power outputs (TAP & TRP). With the exception of peak power expressed relative to FFW all the males' values were significantly higher than the females'. The males' gross body weight was significantly ($p < 0.05$) related to $AMVO_2$, $RMVO_2$, PRP and TRP but not to ($p > 0.05$) PAP and TAP. In contrast the females' gross body weight was significantly ($p < 0.05$) related only to PAP and TAP. There was a significant ($p < 0.05$) relationship between all absolute and relative power values for both sexes. The $AMVO_2$ values were not significantly ($p > 0.05$) related to any power variables for either sex. However the $RMVO_2$ values were significantly ($p < 0.05$) related to PRP and TRP values for the males but not for the females ($p > 0.05$). The results of these data indicate that there may be a sex difference in the relationships of aerobic and anaerobic power. These differences may have been a function of the differing workloads for the males and females or it could be a functional sex difference which warrants further investigation.

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Thursday, April 7
2:00-3:15 p.m.

VALIDATION OF A 15-SECOND BICYCLE ERGOMETER POWER TEST. Timothy W. Henrich and Joe P. Riley, Texas A&M University.

The 15-second bicycle ergometer test has previously been shown to be a reliable measure of mechanical power production. Energy supply for maximal exercise of this duration is provided primarily through the breakdown of high energy phosphates within the muscle cell. As a result of the difficulty of developing field tests to measure power production, the 40-yard dash has been used extensively to estimate power production capability of this energy supply system in athletes. Therefore, the purpose of this study was to determine if a relationship exists between elapsed time for the 40-yard dash and power production during a 15-second bicycle ergometer test. Twenty-seven physically-active subjects performed two sequentially randomized 15-second bicycle ergometer tests and electronically timed 40-yard dashes with 30 minutes rest between tests. Load assignment was identical to that specified for the Wingate Anaerobic Test. The average scores for elapsed time for the 40-yard dash trials and the parameters of peak power (PP), mean power (MP), time to peak power (TPP), and power decay (PD) from the bicycle test were used. Results indicated that elapsed time on the 40-yard dash was correlated with ($p < .0001$): PP - .77; MP -.77; and body weight -.63. Body weight was correlated ($p < .0001$) to PP .79, and MP .82. It was concluded that in this study, the 40-yard dash was a valid estimate of mechanically produced anaerobic power producing capacity as predicted by performance on a 15-second bicycle ergometer test. In developing regression equations to predict elapsed time in the 40-yard dash, it was found peak power and mean power were multicolinear and that PP (R square = .60, F = 37.4) was a better predictor than MP (R square = .58, R = 35.1) of 40-yard dash performance. TPP and PD did not reduce mean square error (MSE) when added to the equation using PP as the independent variable. Adding body weight to the equation with PP increased the MSE and therefore did not contribute to predicting elapsed time for the 40-yard dash. Therefore, the linear equation used to predict performance is: Y(40-yard dash) = 7.9 + (-.001)PP.

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Thursday, April 7
2:00-3:15 p.m.

TEMPORAL CHANGES IN POWER OUTPUT DURING HIGH-INTENSITY EXERCISE

J.H. Williams, W.S. Barnes, J.F. Signorile, Texas A&M University

Friction-loaded cycle ergometers have become a popular tool for measuring power output during brief, high intensity exercise. Power is typically computed as the resistive load times flywheel velocity during a fixed time interval. Often, this limits power measurements to "averaged" values and does not allow for close examination of the rapid changes in power. There appears to be a need for a system which can provide precise and reliable measurements of the temporal changes in power output during this type of exercise. A constant-load cycle ergometer was constructed which allows power output to be measured for each one-half pedal revolution. To determine frictional force, an electronic load cell was attached to the ergometer frame. One end of the flywheel resistance strap was attached to the load cell while dead weights were attached to the strap's free end. To determine flywheel velocity a magnetic switch was attached to the ergometer frame and two magnets placed on the pedal sprocket. Pedalling resulted in switch closures, producing two electronic pulses per pedal revolution. Pulses and load cell output were sampled (512 Hz), digitized and stored on disk by microcomputer. The resistive force was calculated as the difference between the load attached to the strap and that registered by the load cell. Velocity was computed for each one-half pedal revolution by dividing the distance traveled by the flywheel by the time between adjacent pulses. Power output was then computed as the product of force and velocity. Individual power curves were analyzed for peak power output (PP), time to peak power (TTPP) power fatigue rate (PFR) and index (PFI) and total work (TW). To determine the reliability of this system and to examine the relationships between these parameters, adult males performed two-15 sec tests separated by 15 min (n=16) or 48 hr (n=22). Grand means$\pm$SE for each parameter were: PP=1005.8$\pm$19.3 W; TTPP=3.15$\pm$.09 sec; PFI=33.7$\pm$1.0 %; PFR=28.3$\pm$0.4 W/sec; and TW=12.8$\pm$0.3 kJ. Intraclass correlation analysis revealed high test-retest reliability for all parameters recorded on the same or different days (R=.91-.97). No significant differences ($p>.05$) were noted between means of the first and second tests. PP was highly related to TW but only moderately related to PFI and TTPP. These results indicate that the system described provides a means for reliably assessing the temporal changes in power output during short term, high intensity exercise. Also, an averaged measure of maximal power may not adequately describe the entire power curve.

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Thursday, April 7
2:00-3:15 p.m.

The Relationship Between Ventilatory Threshold and Critical Velocity. SL McDowell, KB Kenney, RA Hughes, TJ Housh and GO Johnson. Center for Youth Fitness and Sports Research, University of Nebraska-Lincoln.

The purpose of this study was to validate a treadmill analog of the critical power bicycle ergometer test. Nine adult females ($X \pm SD = 23.47 \pm 2.69$ yrs) volunteered to perform a maximal treadmill test to determine ventilatory threshold (VT). They also performed three treadmill runs to exhaustion at different velocities to determine the "critical velocity" (CV). VT was defined as the velocity ($km \cdot hr^{-1}$) corresponding to the last measured VO_2 prior to a nonlinear "breakpoint" in VE/VO_2, VCO_2/VO_2 or ventilatory equivalent/VO_2. VT was determined independently by two investigators and when differences occured a third investigator was called upon to arbitrate. CV was defined as the slope of the relationship between total distance (km) for each exhaustive treadmill run (at 12.88, 14.49 and 16.20 $km \cdot hr^{-1}$) and total time (hr) to exhaustion for each of the treadmill runs. Therefore the slope of this relationship was expressed as a velocity ($km \cdot hr^{-1}$). The relationship of total distance versus total time was found to be highly linear for each subject ranging from $r = 0.99$ to 1.00. Theoretically CV and VT represent the maximal running velocity which can be maintained without fatigue. The results of a related t-test indicated there was no significant ($t = 2.13$, $p > 0.05$) difference between VT (11.85 ± 0.50 $km \cdot hr^{-1}$) and CV (12.40 ± 0.42 $km \cdot hr^{-1}$). Furthermore, the correlation between VT and CV was $r = 0.86$ ($p < 0.005$) with a standard error of estimate of 0.82 $km \cdot hr^{-1}$. The results of this study indicated that the Critical Velocity test was a valid technique for estimating VT. In addition, the CV test requires the use of only a treadmill and stop watch thereby eliminating the need for the measurement of expired gas volumes and concentrations.

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Thursday, April 7
2:00-3:15 p.m.

HEART RATE AND OXYGEN CONSUMPTION RESPONSE TO WATER AEROBIC EXERCISE. Harold S. Kieffer, Joseph E. Donnelly, Thomas N. Fennessey, Dennis J. Jacobsen, Kristin Hansen, Kearney State College.

Water aerobics utilize arm (A), leg (L), and arm and leg (A + L) exercises to provide conditioning. This investigation used 20 female volunteers ($\bar{x}$ = 20.3 yr) to determine the relationship between heart rate (HR) and oxygen consumption (VO_2) during steady state exercise using A, L, and A + L protocols. Each exercise protocol consisted of a 2 min. incremental warm-up with a 6 min. exercise period at criteria HR of 120-129 bpm, 140-149 bpm, and 160-169 bpm. The subject was submerged to the level of the xyphoid process in a tank of water maintained at 28-30 C. Each test consisted of a randomly selected exercise protocol with 3 exercise bouts at criteria HR and 5 min. of rest between the exercise bouts. HR were verified by telemetry and work load was adjusted to maitain the HR criteria. Expired air was collected by Douglas bag techniques. Repeated measures ANOVA showed significant differences between A and A + L protocols at 120-129 bpm criteria and significant differences between A and L and A and A + L at 140-149 bpm and 160-169 bpm criteria ($p < 0.05$). These differences reflect a diminished VO_2 response of 14-18% at each criteria HR for A compared to L and A + L protocols. Correlations for HR and VO_2 were $r = 0.69$, $r = 0.69$, and $r = 0.63$ for A, L, and A + L protocols respectively. These data suggest a modest relationship between HR and VO_2 during A, L, and A + L protocols and a diminished VO_2 response for A protocol at each criteria HR. The diminished response for VO_2 with A should be recognized when using water exercise for aerobic conditioning.

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Thursday, April 7
2:00-3:15 p.m.

Associations Among Leisure-time Activity, Fitness Level and Coronary Risk Factors in Apparently Healthy Adults. J. Muse, *L.S. Verity, and P. Patterson. San Diego State University.

In recent years, the role of activity versus fitness level has been discussed in terms of their association with coronary risk reduction. Presently, the information on coronary risk reduction for both leisure time activity and fitness appears to be equivocal. Thus, the purpose of this investigation was to determine the relationships among leisure-time activity, fitness, and coronary risk status in 33 apparently healthy adults. Subjects were assigned to a low (n = 18) or high (n = 15) activity group based on activity scores from the Minnesota LTPA Questionnaire (Taylor et. al., 1978). After determining VO2 max for each subject, high (n = 13) and low (n = 20) fitness groups were assigned by Astrand's standards for different ages. Variables assessed on each subject included: resting blood pressures (SBP and DBP), % body fat, cholesterol, triglycerides, HDL, ratio of HDL/T-C, activity level (Kcals of energy expended per day). The t-test results revealed that the high activity group was older (64.5 $\pm$ 1.5 v. 55.9 $\pm$ 1.9 yrs.; $p < .001$), had less body fat (23.8 $\pm$ 2.7 v. 31.5 $\pm$ 2.7%; $p < .05$), and expended more energy per day (456.1 $\pm$ 43.9 v 193.1 $\pm$ 19.1 Kcals; $p < .0001$), than the lower active group. No other variables were different between activity groups. A discriminant analysis revealed that age, % body fat, and diastolic blood pressure differetiated ($p < .003$) between the high and low activity groups and correctly classified 78.9% of the subjects. From the t-test results on the fitness groups, it was found that the high fitness group was leaner (18.8 $\pm$ 1.3 v 34.0 $\pm$ 2.4%; $p < .001$), had lower cholesterol (203.1 $\pm$ 8.7 v 239.4 $\pm$ 6.2 mg %; $p < .008$), and had a higher VO2 max (41.9 $\pm$ 1.6 v 29.6 $\pm$ 1.3 ml/kg/min; $p < .001$). The risk factors that best discriminated ($p < .001$) between high and low fitness groups with 87.9% correct classification were % body fat, cholesterol, and Kcals of energy expenditure per day, respectively. Interestingly, treadmill performance was not significantly correlated with either activity levels or percent of total Kcals per day spent in heavy intensity activities. It was concluded that the high activity and high fitness groups showed a more favorable coronary risk factor profile than the low activity and low fitness groups, and that assessing groups based on either activity or fitness provide subtle differences in identifying coronary risk.

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Thursday, April 7
2:00-3:15 p.m.

EVALUATION OF HEALTH PROMOTION ACTIVITIES AT THE WORKSITE.

L.K. Olsen, M. Wang, R.W. St. Pierre, The Pennsylvania State University, B.E. Stader, K.A. Wotring, L. Perin, Allentown Bureau of Health

Health promotion activities at the worksite have only recently become a part of health department activities. In the present project, the Bureau of Health for the City of Allentown was selected as one of five statewide sites for development of specific health promotion activities in worksite settings. The purpose of this study was to examine the effects of various worksite health promotion activities within one specific worksite in terms of reducing the health risks of employees in that worksite. A total of 300 employees ranging in age from 20 to 64 participated in a special health risk assessment in summer, 1986. A personal health inventory was administered to these employees and the results were used as a basis for planning specific health promotion activities for the worksite. Based upon these results, a total of seven intervention programs were initiated (smoking cessation, blood pressure monitoring, seatbelt utilization, stress management, weight control, nutrition, and exercise programs including aerobics, walking and swimming). In the summer, 1987, the Personal Health Inventory was again administered to those who participated in the various interventions. Analysis of the data indicates that although health risks for the subjects did decrease somewhat, the decrease was not significant. It is speculated that there has not been enough time for the full impact of the interventions to become manifest in the subjects. The specific impact of each of the seven interventions in terms of lowering the health risks of those employed who were exposed to each intervention will be discussed. Implications for the implementation of health department based health promotion activities within the worksite will be presented.

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Friday, April 8
2:00-3:15 p.m.

AN ASSESSMENT OF EMPLOYEE JOB RELATED STRESSORS AS A COMPONENT OF A WORKSITE HEALTH PROMOTION NEEDS ASSESSMENT. Randy M. Page, University of Idaho.

The purpose of this study was to identify the extent to which various job and organizationally related stressors contribute to job stress, job satisfaction, and psychosomatic complaints (i.e., headaches, loss or gain of appetite, sleep disturbances). The sample for this study consisted of 646 employees in the Colorado Department of Natural Resources who completed an employee stress survey as part of a health promotion needs assessment study. Multiple regression analyses were conducted to determine the relative importance of specific stressors to job stress, job satisfaction, and psychosomatic complaints for the total sample as well as by job category. Factors which most significantly contributed to job stress were the lack of supervisor support, work overload, role ambiguity, role conflict, and the ability to participate in decisions directly relating to one's job. In addition, these factors were significantly correlated with job satisfaction and the occurence of psychosomatic complaints. The degree to which certain stressors influenced stress consequences differed between job categories (e.g., clerical workers and managers). An understanding of such relationships will assist health promotion specialists in designing effective worksite stress management and reduction strategies and programs.

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Friday, April 8
2:00-3:15 p.m.

Characteristics of Self-selected HRA Users: Implications for a Worksite Health Promotion Program. Wendy D. Lynch, Ph.D., Thomas Golaszewski, Ed.D., Center for Corporate Health Promotion.

Health Risk Appraisals (HRA) have become a standard feature in many worksite Health Promotion programs. Group assessments of health risk using HRAs provide valuable information about the collective level of health, potential future health needs, and promising risk reduction programs for a set of individuals. Researchers may use HRA data to establish a baseline measure of health or to predict the possible impact of planned interventions. However, little information is available about the characteristics of those who choose to use HRAs. Without such information, the generalizablity of measured health risks or changes in health status are in question. The purpose of this investigation was to examine the differences between HRA users and non-users. Demographic characteristics of self-selected users (HRAU) of the Lifescore Plus HRA (n=2600) were compared with those of non-users (HRAN, n=4389). Subjects were identified as all home office, full-time employees, having a three year employment history and group health insurance with a large insurance corporation. There was no association between gender and HRA use (HRAU were 53% male, HRAN were 55% male; χ^2 =2.46, p>.10). HRA users were significantly younger, $\bar{x}$= 39.7, s=10.8, than non-users, $\bar{x}$= 41.1, s=11.6, (t=5.10; p<.001). Sixty-one percent of HRAU were exempt-status employees, who are higher paid and typically more educated than non-exempt employees, while only 48% of the HRAN were exempt-status employees (χ^2=120.2, p<.001). HRA users were more likely to submit personal medical claims. Claims were submitted by 78% of the HRAU group and by 72% of the HRAN (χ^2=29.1). Despite the difference in proportions of filed claims, there was no significant difference in average claims amount between the two groups. Mean claims (including zero values) for HRAU was $539.38 (s= $1546.58, Md=93.62), while average claims for HRAN was $491.21 (s= $1356.32, Md= 78.98). These findings suggest that HRA users were not representative of the overall worker population defined in this investigation. HRAU tended to be younger and higher paid employees. However, HRA use was not associated with lower medical costs. The differences between HRAU and HRAN indicate that changes in health status measured with the HRA cannot be generalized to the employee population, nor can the direction of selection bias be easily estimated.

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Friday, April 8
2:00-3:15 p.m.

AN ASSESSMENT OF THE RELATIVE EFFECTIVENESS OF TWO HEALTH PROMOTION PROGRAM MARKETING STRATEGIES. Robert F. Valois, University of Texas, Sandra K. Kammermann, Carle Clinic Association, Urbana, IL, Thomas W. O'Rourke, University of Illinois.

The health care industry is the second largest in the United States. Its growth has been continuous and significant. Medical care expenditures in 1960 were $26.9 billion or 5.3% of the Gross National Product (GNP). By 1985 health care costs increased to $425 billion or 10.7% of the GNP. The past decade has witnessed an increase in competition for the health dollar. This competition has led to increasing emphasis on marketing. Health promotion programs within health care settings are often dependent upon effective marketing techniques. The purpose of this study was to evaluate the effectiveness of two marketing strategies to promote clinic-based health promotion programs in a midwestern community of 100,000 people. In this study the effectiveness of a comprehensive four page, bi-annual health promotion program brochure was compared to periodic, program-specific newspaper ads. Effectiveness was evaluated in terms of the number of program registrants and marketing cost. Data were collected for several years. Both descriptive and inferential statistical analyses were utilized. Results indicated the superiority of periodic program-specific newspaper ads over the four page health promotion program brochure inserted bi-annually into the community newspaper in terms of the number of program registrants. Cost benefit analysis also indicated the effectiveness of periodic spot ads vs. the bi-annual brochure. Health educators in health care settings may improve their marketing efforts by utilizing similar marketing strategies.

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Friday, April 8
2:00-3:15 p.m.

AN EVALUATION OF THE BUFFALO TEACHER STRESS INTERVENTION PROJECT.

William M. London, Kent State University, Thomas J. Golaszewski, Center for Corporate Health Promotion; Mike M. Milstein, University of New Mexico; R. Daniel Duquette, University of Wisconson, LaCrosse.

The purpose of the study was to determine the effects of the Buffalo Teacher Stress Intervention Project on participants' self-reported personal manifestations of stress and perceptions of stressors in the school environment. Participants included teachers and administrators from four elementary schools in Buffalo, NY. In each school the following data were collected in September (pretest) and again in June (posttest): blood pressure (systolic and diastolic), serum cholesterol, responses to a health risk appraisal, and responses to the Stress in School Inventory. Each school was assigned at random to one of four program conditions for the school year: 1) personal health promotion, 2) organizational development, 3) both personal health promotion and organizational development, and 4) no program (control). Personal health promotion consisted of three phases: awareness, instruction, and activation. The awareness phase consisted of feedback regarding HRA results (given at all four schools) and counseling regarding the instruction phase. The instruction phase consisted of workshops on nutrition, relaxation, and exercise. The activation phase consisted of organizing health promotion committees. Organization development consisted of three phases: awareness, design, and intervention. The awareness phase involved school personnel in activities to diagnose organizational stressors. The design phase included goal setting and motivating personnel to take ownership regarding school problems. The intervention phase consisted or organizational changes (e.g., incentives) to address specific identified problems. Based on data collected using the Stress in School Inventory, six factor analytically derived subscales were the dependent variables: administrative dissatisfaction, career development distress, distress arising from responsibilities, emotional manifestations of stress, physical overarousal, and stomach problems. Two-way (time of year and program) repeated measures ANOVA's were performed (N ranging from 55 to 62). No significant time x program effects were found. Significant reductions from September to June were found for emotional manifestations, overarousal, and stomach problems. Possible interpretations of these findings are: 1) June is a less stressful time than September regardless of intervention, or 2) a Hawthorne effect was introduced in the control group during pretest data collection which motivated control participants to manage their stress as well as personnel from the intervention groups.

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Friday, April 8
2:00-3:15 p.m.

PROSPECTIVE ELEMENTARY TEACHERS HEALTH BEHAVIORAL PATTERNS. Charles Hale, University of Florida and Mary Sutherland, Florida State University.

This study was designed to determine the health behavioral practices of selected prospective elementary classroom teachers. The jury validated Live Longer and Prosper Health Practices Instrument was administered to all 81 prospective elementary classroom teachers enrolled in an elementary health and physical education methods course. The instrument addressed health practices in the areas of nutrition; weight gain/loss; exercise patterns; cigarette, alcohol and illicit drug use; seat belt use; cancer/cardiovascular disease prevention and; chronic disease history. The population consisted of eighty-one white (95.1%) females (97.5%), with an age range of 19 to 46 years. The majority of the participants age ranged from 20 to 22 (80.3%). Most of the participants were single (82.7%), and enrolled as full time students (95.1%). Major findings from the analysis of the percent data follow:

---Approximately fifty percent of the participants mostly or sometimes added salt to their food at the table on a regular basis. Red meat was eaten one to two times weekly by about fifty percent of the participants. Additionally, thirty-seven percent of the participants were on a diet to lose weight and collectively, the dieting participants had lost a total of 275 pounds or a mean loss of eleven pounds per dieting participant.

---Over ninty-five percent of the participants took part in physical activities. More popular physical activities included aerobics (28.4%), walking (22.2%), weight lifting (7.4%), or racquet ball (6.2%). Finally, aerobics and walking participants exercised an average of 3.6 times weekly. The weekly exercise total mean time was two hours and twenty-one minutes for the aerobics participants and one hour forty-eight minutes for the walkers.

---Nine individuals smoked cigarettes, with the number of cigarettes smoked daily ranging from three to twenty-five. Eleven percent of the participants smoked marjuanna less than one time weekly and approximately fifty percent of the participants did not drink alcohol.

---Fifty percent of the participants used their seatbelt nearly always or always while driving or riding in a car.

---Sixty percent of the female participants had visited their physician for a pap smear during the past year and twenty percent of the female participants examined their breasts monthly for lumps.

In general, the level of health practices of the teachers exceeded those of similar type populations, per 1990 Objectives of the Nation Midcourse data (Provisional Data from the Health Promotion and Disease Prevention Supplement to the National Health Interview Survey.) Selected 1990 Objectives of the Nation midcourse data comparisons, which have been used for group motivational purposes, will be shared.

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Friday, April 8
2:00-3:15 p.m

Health Instruction in Elementary Classrooms -- A Matter of Chance or Choice? Dennis W. Smith, University of North Carolina at Greensboro; Cynthia A. Wolford, Kent State University

The fourth edition of School Health in America (Kolbe et al.) indicates that there is great diversity nationwide in certification requirements for elementary teachers in health education. Fifty-one percent of states do not require these individuals to take such coursework. The purpose of this study was to assess the impact of a three credit, health content/methods course on the perceived importance of health instruction for elementary-aged children in college students who, for the most part, will fulfill the health instructional role as elementary teachers. The experimental design involved a rank ordering process ("Health" was one of 15 topics in this exercise) called "Subjects in a School Day" (SSD) which was developed for this study from the minimum instructional requirements in Ohio elementary schools. The sample population was comprised of two experimental groups (n=38, H1; n=11, H2) and a control group (n=27, C1). H1 and H2 each received a pre-test, treatment (a 15-week "Health Education for Elementary School" course) and a post-test. The control group received pre/post testing without treatment. All students in the experimental and control groups were elementary education majors at a large midwestern university. Preliminary results from an ANOVA on the differences between the experimental and control group means were tabulated. Statistically significant results were identified between H1 and C1 ($p < .01$) and H2 and C1 ($p < .01$) for group mean scores on SSD in regard to the importance of health in a school day. The H1 and H2 group means' perceptions of the importance of health teaching significantly improved as a result of the experimental treatment while the control group remained fairly stable. The identification of statistically significant changes in responses indicates that a well-designed learning experience can provide short-term perceptual changes concerning the importance of health in the elementary school. There are further implications for analysis of the long term impact of such coursework on inservice teachers.

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Friday, April 8
2:00-3:15 p.m.

PROFESSION, EDUCATIONAL LEVEL, AND SECONDARY HEALTH EDUCATION AS RELATED TO WOMEN'S HEALTH PRACTICES. Dianne O'Brien, Murray State University, Murray, Kentucky.

The purpose of this study was to investigate the relationship of women's profession, educational level, years of high school health education on 29 health related variables such as exercise, sleep, alcohol use, diet, smoking and weight. This study is the development of an earlier study that examined health practices of women. The subjects were 636 women who attended a women's health conference in a mid western town. Chi square results from the questionnaire indicated that some health practices were significantly ($p < .05$) related to profession. These included nutritious diet, regular balanced meals, sleeping seven to eight hours per night, weight, breast self-examinations, visits to physicians and memberships in women's support groups. Professions of the women were: nurses 13%, secretaries 12%, clerks & sales women 12%, teachers 10%, managers 6%, health technologists 4%, social workers 4%, home economists 1%, not employed 20%. The four largest groups (secretaries, clerks & sales, teachers, and nurses) were not significantly different in having a nutritious diet, alcohol consumption, sleeping seven to eight hours per night, an eating breakfast. Significant differences between the groups included the following: clerk & sales women ate fewer regular balanced meals than other groups, teachers were less likely to smoke or be overweight, nurses and secretaries reported exercising more frequently than the clerk & sales and teacher groups. College educated women reported significantly less consumption of alcohol, more frequent breast self-examinations, pap smears, and visits to the doctor but fewer days and hours of vigorous physical activity. Years of high school health education was positively and significantly related to the amount of sleep, weight, nutritious diet, and fitness. Furthermore, years of high school health education was negatively related to alcohol consumption and use of over the counter drugs. Years of high school health education was significantly related to the state in which the woman was educated. Only 53% of the women had more than one year of high school health. Alcohol consumption, pap smears, nutritious diet, weight, amount of sleep, and days of vigorous activity were significantly related to state in which woman was educated.

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Friday, April 8
2:00-3:15 p.m.

THE ROLE OF WOMEN'S HEALTH IN HEALTH EDUCATION

Richard W. St. Pierre, The Pennsylvania State University
Mary E. Taylor, The Pennsylvania State University

This presentation includes (1) a discussion of the background and nature of women's health studies; (2) a brief content outline of the graduate women's health course offered in the Department of Health Education at Penn State University; (3) a description of a survey to investigate the status of women's health courses offered by departments of health education throughout the United States; and (4) the results and implications from this survey. Prompted by philosophical, epistemological, and political assumptions regarding wellness in general and wellness for women in particular, the offering of women's health courses has increasingly generated academic support. With the exception of clinically based courses such as those taught in medical schools, schools of public health, and schools of nursing, most women's health courses have been multidisciplinary in nature. Using a broad sociocultural framework including political, economic, and psychological dimensions, courses tend to discuss issues rather than disseminate information. For this survey, all of the programs listed in the Eta Sigma Gamma National Director of College and Health Education Programs and Faculties were contacted to determine how many departments offered or planned to offer a women's health course, and to find out details about the quality, frequency, content, and materials used in existing courses. Of the 197 surveys sent out, 149 (75.6%) were returned. Fifty-nine (39.6%) of the health education departments indicated that they did offer a women's health course, 82 (55%) did not offer one, and 8 (5.4%) were seriously considering or planning to offer a women's health course in the near future. Twelve of the 82 health education departments not offering a women's course indicated that women's health was taught elsewhere on campus, i.e., women's studies, nursing, or sociology. Two additional departments cross-listed, but did not teach a women's health course. The majority of these courses are offered every other term, at the undergraduate level, enroll between 15 and 24 students, and are taken primarily by female students. Given the apparent interest in this area, our professional associations should begin exploring the inclusion of sessions on this topic at annual meetings. One of the most crucial tasks that should be addressed is the development of a theoretical framework that cuts across academic disciplines but is health oriented in nature. Panel discussions, workshops, and special interest sessions could easily accommodate this topical area.

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Friday, April 8
2:00-3:15 p.m.

USE AND COMPREHENSION OF HEALTH INFORMATION AMONG COLLEGE STUDENTS: IMPLICATION FOR HEALTH EDUCATION PROGRAMMING. Ruth Ahia, University of Arkansas; Denise Myles, St. John's Mercy Medical Center.

Effective health communication occurs when there is a common set of meanings between a speaker and a recipient. To a large extent, the major source of misunderstanding between health educators and lay persons is the use of technical terms or professional jargons with the assumption that the jargons are interpreted accurately by lay people. While comprehension of information is not a sufficient basis for use of such information, it is probably a necessary one. An individual who is unable to comprehend a given health information is unlikely to use such information. Therefore, comprehension and use of valid health information is essential for health maintenance and disease prevention. The purpose of this study was to examine foreign students' use and comprehension of health information. The sample for the study consisted of 40 foreign students who participated in an eight week health program. An instrument consisting of 45 items was completed by the subjects two weeks after the eight week health program. The testing instrument included terms related to cardiovascular diseases, cancer, fitness, nutrition and weight management, sexuality, alcohol and drugs, and health care consumption which were extracted from different pamphlets and information disseminated to participants of the program. Experts' evaluation of the instrument were used to determine the validity. Test-retest was used to determine the reliability of the instrument as $r = .876$. Descriptive statistics (frequencies, percentages, means and standard deviation) were utilized in analysis of data generated. Specific results include: The initial impression of very low rates (35%) of information acquisition. The lowest correct score among this group was in the area of cancer, alcohol, drugs and health care consumption. These areas were also perceived as less important and interesting by respondents. Prior training/education appear to be correlated to proper use and accurate interpretation of health education term/information. Failure to correctly comprehend health terms may be symptomatic of a much broader set of problems. Provisions of information does not necessarily translate to utilization of such information. Based on the findings, it is recommended that Health Educators involved with Health Education programming for foreign students become more sensitive, that this population may have different interpretation of professional terms and may not for different reasons ask for clarification of terms. Without such sensitivity, much of the health information provided to this population may be destined to low utilization or failure.

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Friday, April 8
2:00-3:15 p.m.

HEALTH KNOWLEDGE & ATTITUDE SCALE DEVELOPMENT: A TAXONOMIC APPROACH

Robert F. Valois University of Texas at Austin

Development and utilization of knowledge and attitude instruments in health education research is paramount. However utilization of the hierarchical structure, the Taxonomy of Educational Objectives (Bloom, 1956 & Krathwohl, 1964) is lacking in this regard. A vast majority of the knowledge and attitude scales utilized are geared to the lower levels of learning and internalization, knowledge and receiving respectively. The major purpose of this study was to design a valid and reliable health attitude and knowledge scale based upon the hierarcical structure of the Taxonomy of Educational Objectives-Cognitive and Affective Domains, to eventually assess the association between affective and cognitive outcomes of a required health course for college undergraduates at a mid-western university. The 80 item cognitive & affective scale consisted of five subscale topics; nutrition-weight control, stress management, exercise-fitness, alcohol use and smoking. The cognitive section contained 30 multiple choice items with 4 response alternatives & 10 multiple true-false items with 5 cognitive statements.Cognitive items were developed for the knowledge, comprehension, application & analysis-synthesis levels. The affective section consisted of 40 five-point Likert Scale items, developed to represent receiving responding, valuing & organization levels for all 5 subscale topics. Systematic regimen for scale development folowed these steps; developing initial pool of cognitive & affective items, review by educational psychologists, revision according to consultants recommendations, assessment of content validity by health educators, pilot testing, assessment of item reliability and revision of scale items based upon statistical analysis of pilot-test data. Final analysis indicated a reliability measure .70 via Kudder-Richardson-20 for the cognitive scale and reliability coefficients (Cronbach) ranging from .67 to .81 for the affective scale based on the 390 students who responded in the pilot phase of the study. Hierarchical structure of the cognitive & affective domains was supported by a correlational analysis of mean scores for each taxonomic level. For both domains the student mean scores showed a gradual decrease from lower (knowledge/receiving) levels to higher (analysis-synthesis/organization) levels of the Taxonomy These findings give creedence to the validity of the "building block" nature of learning in health education and the the sound principles of instrument construction based on the Taxonomy of Educational Objectives as an operational framework. Implications are for health educators to move beyond the prusuit of trival health knowledge & internalization & challenge students to think and value at higher levels and to test and evaluate accordingly.

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Friday, April 8
2:00-3:15 p.m.

ASSESSING KNOWLEDGE AND ATTITUDES OF SELECTED ILLINOIS REGISTERED PSYCHOLOGISTS ON NEAR-DEATH PHENOMENA: IMPLICATIONS FOR HEALTH EDUCATION. Barbara A. Walker; Eastern Illinois University.

The purposes of this study were to determine the knowledge and attitudes of registered psychologists toward near-death phenomena, and to determine how many of these psychologists had undergone a near-death experience (NDE) or had counseled a near-death client. Thornburg's Near-Death Phenomena Knowledge and Attitude Questionnaire (NDPKA) was used to assess how much Illinois registered psychologists knew regarding near-death phenomena. Likewise, attitude toward the topic of near-death, and near-death clients, was assessed. Questionnaires were distributed to 326 registered psychologists randomly selected from a State of Illinois Department of Registration listing, and 117 usable questionnaires were received. Of the participating sample, 58% were males, 41% were females, and one did not indicate gender (1%). The mean age for all respondents was 46 years old, and most were Clinical Psychologists (81%).

The mean score for knowledge questions was 7.5 out of a maximum score of 18 (n = 115). Respondents were most knowledgeable about questions dealing with the near-death element of "peace". Likewise, knowledge of out-of-body transcendence and tunnel/light phenomenon were affirmed within written near-death accounts. Respondents were least knowledgeable about questions dealing with drug use and near-death, and the relationship of suicide to near-death incidence. The mean score for the attitude portion of the instrument was 61.3, with a maximum score of 85 points (n = 113). This score was based on a five point scale; the higher the score, the more positive the attitude. Seven-percent of the participants indicated having personally had a near-death experience, while 19% indicated having counseled near-death clients. Likewise, 28% indicated having had personal contact with an experient (clients; friends and family).

When considering that an estimated eight million Americans have personally experienced near-death phenomena (Gallup, 1982), and in light of these data, the potential for professional exposure within the health care industry is high. It is evident that this is an area of clinical concern which should warrant educational involvement within the fields of health education, psychology, and related human service professions so that the emotional needs of near-death clients can be recognized and served.

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Friday, April 8
2:00-3:15 p.m.

OPINIONS OF ETA SIGMA GAMMA MEMBERS AND HEALTH EDUCATION LEADERS REGARDING ETA SIGMA GAMMA-SPONSORED ACTIVITIES. Brenda A. Smith, University of Texas at El Paso.

The purpose of the study was to survey Eta Sigma Gamma members and health education leaders to determine demographic characteristics, opinions regarding sponsored activities, and contributions of and suggestions for Eta Sigma Gamma, the professional, honorary society for health education students and professionals. The primary sample for the study consisted of 300 active Eta Sigma Gamma members. The secondary sample consisted of 19 nationally recognized health education leaders. Data were collected from both groups via mail survey instruments. Data were analyzed descriptively. Also, student and non-student members were statistically tested on their awareness and ratings of national activities, chapter activities, publications and the awards systems. The majority of the membership was non-students between the ages of 21 - 30. Chi square tests showed that non-students (practicing professionals) were more aware, to a statistically significant degree (= .05), of one national activity, the "Council of Delegates," and one publication, the Research Council Scientific Forum Abstracts, than were student members of Eta Sigma Gamma. The publication, The Eta Sigma Gamman, was the only sponsored activity for which the Kendall Tau c value showed a statistically significant relationship (= .05), between the members' scholastic status (Student, Non-student) and their ratings of The Eta Sigma Gamman. Students were slightly more likely to favorably rate the value of The Eta Sigma Gamman than were non-students. Member awareness and ratings of sponsored activities were generally favorable. Listed contributions indicated the organization contributed to the individual and the profession. Suggestions tended to be in the categories of "Better Communications," "Chapter Improvement" and "Publications." The health education leaders, for the most part, were not members of Eta Sigma Gamma, nor were they aware of its activities. A small number of leaders provided favorable ratings of the activities and a few suggestions for the organization. "Publications" were noted as an important contribution.

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Friday, April 8
2:00-3:15 p.m.

GENDER-RELATED RESULTS OF A NATIONAL COLLEGE-LEVEL HEALTH EDUCATION FACULTY SALARY SURVEY, 1986-87.

Thomas W. O'Rourke, University of Illinois, Gary D. Gilmore, University of Wisconsin-LaCrosse, Warren E. Schaller, Ball State University, Kenneth C. Becker, University of Wisconsin-LaCrosse.

Faculty salary differences by gender is a topic of widespread interest and debate. National health education/ health science faculty salary data by gender are not reported to any central agency. This study fills that void and provides a valuable data base for the profession. Administrators and faculty should find these data particularly useful.

This study was sponsored by Eta Sigma Gamma, the National Professional Health Science Honorary and conducted during the 1986-87 academic year. Utilizing other national salary surveys and methodologies, a detailed salary survey was developed and mailed to the head of the department or division of all 312 institutions listed in the Association for the Advancement of Health Education Annual Directory of health education programs. The response rate was 66.7%. Deleting unusable data resulted in a 58.5% response rate. Salary data were collected on individual faculty members, along with their age, rank, highest degree, number of years in present position, tenure status, gender, and primary responsibility (school health, community health, or other, such as physical education, athletic training, allied health and so forth). Faculty salary results by geographic region, rank and primary professional responsibility have been previously reported. This study focused upon a detailed analysis of faculty salary by gender. A stepwise multivariate statistical analysis was used. This technique identified the relative contribution of gender along with other independent variables such as age, years in current position and tenure status. Throughout the analyses, rank was used as a controlling variable. Results indicated few gender differences in faculty salary after including other independent variables in the regression equation. It appears that, in most instances, other independent variables exert greater influences upon faculty salary than gender.

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Friday, April 8
2:00-3:15 p.m.

SACK LUNCH VS. SCHOOL LUNCH FOR ELEMENTARY CHILDREN. Dickie Hill, Abilene Christian University and Deonna Shake.

Research has demonstrated that children show a marked degree of progress physically, mentally, and emotionally after improving their eating habits. Although the role of nutrition is vital, good eating habits are lacking in elementary school children of today. The purpose of this study was to compare the nutritional value of school lunches to sack lunches from home. The researchers were interested in determining the nutritional soundness of the sack lunch in comparison with the school lunch which had been planned by a dietician. Subjects were 205 elementary school students in grades one through five from three different schools. After identifying subjects who brought sack lunches, a questionnaire was administered. Background information was obtained with questions such as: Who packed the lunch?, How often were lunches brought?, Did the student eat breakfast?, etc. Contents of each sack lunch were then evaluated. Food items of each sack lunch were recorded, tallied and compared to the USDA's minimum requirements recommended for a healthy lunch. The following areas were used to evaluate the sack lunches: (1) meat or meat alternate, (2) vegetable and/or fruit, (3) bread or bread alternate, (4) milk, and (5) extras. Results of this study revealed that both cost effectiveness and nutritional soundness were superior in the school lunches. Sack lunches were found to have an over abundance of "empty" calories in proportion to the total number of calories in the lunch. The typical sack lunch calorie count was 1,426 Kcal. Of this total, 761 Kcal came from cookies and chips. Since half of the calories were from this source, it was concluded that nutrition education is needed in the home. Parents and children may not realize the nutritional deficiencies of the sack lunches they prepare. Another possibility is that they know but do not care. Sack lunches were most deficient in the fruit and vegetable and milk groups. Nutrition education in the classroom is one answer to providing better nutrition for students. Educating parents is also an important factor. Schools provide well balanced meals, but if the student does not eat all of it, the value is lost. School administrators must continually search for ways of providing nutritional meals which children will like.

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Friday, April 8
2:00-3:15 p.m.

BLACK ADOLESCENTS' PERCEPTIONS OF CANCER UTILIZING THE HEALTH BELIEF MODEL. James H. Price, Sharon M. Desmond, Margaret Wallace, The University of Toledo; Daisy Smith, Paula M. Stewart, Cordelia Martin Health Center.

This study was undertaken to determine whether black and white adolescents differed significantly in their cancer knowledge, attitudes and beliefs. Utilizing the Health Belief Model (HBM), a 97-item questionnaire was developed by the researchers and completed by 573 black and 297 white junior high and senior high school students from a large midwest school district (79% response rate). Test-retest reliability was established for the instrument using 24 black students (subscale r's = .40 to .95). Readability of the questionnaire was 7th grade. Chi-square analyses yielded 14 significant differences (p .05) between blacks and whites on their cancer knowledge (etiology, warning signs and prevention techniques). Further significant differences were found when items comprising the separate HBM subscales were analyzed. Blacks and whites differed significantly on cues to action (1 item), perceived susceptibility (4 items), perceived severity (1 item), perceived barriers (3 items), perceived benefits (3 items), and interpersonal relationships (3 items). Blacks and whites received cancer information from the same sources, primarily TV, school, and family members. Implications of these results will be given for developing a cancer education program for junior high and senior high schools.

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Friday, April 8
2:00-3:15 p.m.

ATTRIBUTIONS TOWARDS THE CONCEPT OF HEALTH AND THEIR RELATIONSHIPS TO HEALTH BEHAVIORS IN COLLEGE STUDENTS.

Peter F. Mulhall, University of Illinois: William H. Creswell Jr., University of Illinois.

Attribution theory is a process whereby people attempt to explain and interpret events in their everyday lives so that they can gain a better understanding of themselves and their interaction with the environment. Attribution theory can be used to explain causality of behaviors as internal vs. external, stable vs. unstable and controllable vs. uncontrollable. A person's concept of health and subsequent health behaviors may be greatly affected by one's attributional concept of health. A convenience sample of 220-undergraduates at a large midwestern university was used in this study. Health attributions were obtained by adapting Weiner's (1970) model of achievement motivation. Students were asked to rate their concept of health on a 7-point Likert scale as internal or external, stable or unstable and controllable or uncontrollable. They were also asked to rate four health problems on their susceptibility, seriousness and preventability. Health behaviors, pertinent to this age group were derived from a standard health hazard appraisal. A total health behavior score was calculated by weighting and aggregating the sum of health behaviors. Preliminary data analysis using stepwise multiple regression showed that students who viewed health as unstable and controllable engaged in a greater number of health behaviors (R^2=.59). Locus of control, perceptions of susceptibility, seriousness and preventability were not significantly related to total health scores. However, several combinations of these variables were predictive of single health behaviors. Further analysis is being done to delinate and explain the patterns of attributional responses as they relate to a single and clustering of health behaviors.

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Friday, April 8
2:00-3:15 p.m.

NATIONAL EXAMINATION OF CARDIOVASCULAR KNOWLEDGE 1983-1987.

Charlene Agne-Traub, Ph.D., Howard University;
Lee Pratt, Ed.D., Virginia Commonwealth University;
Stephen Stewart, Dr.P.H., James Madison University;
Martin Turnauer, Ph.D., Radford University.

Heart disease has been the number one killer in the United States for over forty years and is a major factor in the developed countries of the world. The American Heart Association's national headquarters developed an examination of cardiovascular knowledge (NECK) for the purpose of assessing health knowledge. The NECK consists of multiple choice items covering the following four areas: heart and circulatory system, cardiovascular diseases, risk factors, and warning signs. A task force of four university professors from Virginia utilized the NECK for assessing cardiovascular knowledge among 4,917 high school students, 2,000 elementary students, 1,600 preschool children, and 534 entering college freshmen in Virginia. The research project established baseline data and competency levels for the state and will help chart advances in years to come. Virginia Department of Education staff were invited to participate on the task force to provide direction in working with Virginia schools. The utilization of the NECK represents a step towards strengthening the scientific base of health education by initiating longitudinal studies upon which curriculum will be developed and evaluated. This study established baseline data, competency levels and health behavior comparisons.

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Friday, April 8
2:00-3:15 p.m.

KNOWLEDGE, ATTITUDES AND PRACTICES OF UNDERGRADUATE COLLEGE STUDENTS REGARDING ACQUIRED IMMUNE DEFICIENCY SYNDROME (AIDS)

Steven R. Furney, Southwest Texas State University

Significance. Never in recent history has a disease caused the fear and public concern that AIDS has brought about. Since this is a disease with no known cure or effective treatment, emphasis needs to be directed toward education and prevention.
Purpose. The purpose of this study was to examine the AIDS knowledge and attitudes of undergraduate college students and to determine if a relationship existed between knowledge and attitudes of the subjects and their social/sexual behaviors.
Methodology. A questionnaire consisting of 39 items was designed by the researcher. The questionnaire contained: background information; knowledge of AIDS (causative organism, methods of transmission, high risk groups and behaviors, prevention strategies, etc.); social and/or sexual behavior related to AIDS; views on mandatory AIDS screening; and future predictions for the prevention and control of AIDS. A total of 212 undergraduate college students enrolled in a mid-sized southern university were administered the anonymous survey questionnaire.
Findings. Of the 212 questionnaires administered, 44 were incomplete or otherwise unusable for analysis. Usable data were received from 168 subjects. It was found that 44.6% of the subjects knew what AIDS stands for, 15.5% knew the name of the causative organism, 85.1% knew how AIDS can be transmitted, and 83.9% knew prevention measures for AIDS. At the same time 46.4% experienced concern over AIDS which had an influence on their sexual practices, 67.3% felt that AIDS would have an influence on their future sexual practices, 29.8% experienced concern over AIDS which had an influence on their social behavior, and 44.9% felt that AIDS would have an influence on their future social behavior. Statistical procedures indicated that subjects with greater AIDS knowledge experienced more concern over AIDS as indicated by their current and predicted future sexual/social behaviors. Conclusions based on these data suggests that AIDS education can effectively modify behavior related to the spread of AIDS.

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Friday, April 8
2:00-3:15 p.m.

AIDS SURVEYS: THE EFFECTS OF QUESTIONNAIRE FORMAT. Sharon M. Desmond, James H. Price, The University of Toledo, Toledo, Ohio 43606.

The purpose of this study was to examine the influence of questionnaire format on participants' responses. It was hypothesized those receiving a monothematic (single-topic) survey would respond in a biased manner as the nature of the questionnaire may sensitize them to the content. This study examined students' perceptions of AIDS and whether they were affected by a monothematic or polythematic (multi-topic) questionnaire format. College students in general education classes at three large midwest universities participated. Students were randomly distributed one of two anonymous and confidential questionnaires, the Health Problem Survey (N = 300) and the AIDS Survey (N = 300). The former survey assessed students' attitudes and beliefs regarding AIDS in relation to 5 other serious health problems (heart disease, cancer, cerebrovascular accident, diabetes mellitus, and serious auto accident) while the latter examined attitudes and beliefs toward AIDS only. There was a 90% return rate with the polythematic survey (N = 269) and a 77% return rate for the monothematic survey (N = 231). Chi-square analyses and t-tests were utilized for data analysis. Five AIDS attitude questions were asked and statistical differences (p .001) were found based on the type of questionnaire received. Contrary to our expectations, students who responded to the polythematic questionnaire were more frightened of AIDS and in a greater hurry to solve the problem. In support of our hypothesis, those who responded to the monothematic questionnaire perceived themselves more susceptible to AIDS, believed it was the worst disease to have and they were willing to allocate more funds toward AIDS research.

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Friday, April 8
2:00-3:15 p.m.

Alcohol Attitude Scale for Teenagers: A Short Form. Mohammad R. Torabi, Indiana University.

A lack of valid measurement devices has still remained as a major obstacle in research and evaluation of health education programs. An alcohol attitude scale for teenagers developed by the investigator was found to be a valid tool for researchers. However, because of the length of the scale, it is not a feasible device for the practitioner in health education. Thus, the purpose of this study was to develop a shorter form of the scale. An alcohol attitude scale for teenagers, composed of 54 likert type items, was reduced in length to produce a short form. Stepwise discriminant function analysis of the data identified 19 items which were the greatest discriminators between drinking and nondrinking teenagers. For the purpose of cross-validation, the short form of 19 items was administered to a representative sample of over 900 teenagers in several school districts in the Midwest. The collected data were analyzed by using univariate and multivariate statistical methods for testing hypotheses related to validity and reliability of the short form. Results demonstrated highly significant levels of internal consistency and discriminating power of items and the total scale. The short form of the attitude scale for teenagers was found to be a valid and reliable instrument for use as an alternative of the longer alcohol attitude scale from which it was derived.

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Friday, April 8
2:00-3:15 p.m.

ADOLESCENT ALCOHOL CONSUMPTION AND LEGAL DRINKING AGE (PRELIMINARY FINDINGS IN A THREE YEAR STUDY). Susan K. Arndt, Indiana University.

The purpose of this study was to examine adolescent alcohol consumption in a state with an increasing legal drinking age. Florida legislated a new drinking age law in 1985, grandfathering those who were already drinking. This set up a unique situation in which the drinking age was 19 for a year, 20 for a year, and 21 thereafter. This study was undertaken to examine the alcohol consumption of underage drinkers during that three year period. A control group was established in a state whose minimum drinking age had always been 21. Adolescent alcohol consumption was determined by analysis of responses to questions on an anonymous, confidential survey. The responses were tabulated and frequency tables connstructed. A quantity-frequency index was derived from a cross tabulation (using the Statistical Package for the Social Sciences) of questions regarding frequency of consumption and usual amount consumed. Examination of the frequency tables and the quantity-frequency indices made possible the calculation of the percentage of alcohol users and non-users in each state and the patterns of consumption. Analysis of the data was performed using Chi-square and significance was set at the .05 level. In the first two years of the study, 5100 questionnaires were sent to seventh-, ninth-, and twelfth-graders in 21 schools in randomly selected school districts in the two states. Examination of the results demonstrated no significant differences between the two states when all respondents were considered as a group. Although legal drinking ages differed, no trend by state was apparent. Further analysis of the data uncovered differences at specific grade levels in some categories. However, there was no significant difference in the percentage of alcohol users between the two states in either year, and the percentage did not change within either state during the first two years of the study.

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Friday, April 8
2:00-3:15 p.m.

AN ANNALYSIS OF THE RELATIONSHIPS AMONG SELECTED ATTITUDINAL, DEMOGRAPHIC, AND BEHAVIORAL VARIABLES AND THE SELF-REPORTED ALCOHOL USE BEHAVIORS OF PENNSYLVANIA ADOLESCENTS. Lori J. Bechtel, Pennsylvania State University, Altoona Campus.

The purpose of this study was to evaluate the relationships among various attitudinal, demographic, and behavioral variables and the self-reported alcohol use behaviors of school-based Pennsylvania adolescents. Specifically, this study examined the impact of the following independent variables on alcohol use: 1) behavioral intention to use alcohol, 2) attitude toward school, 3) incidence of school misconduct, 4) time spent in sports, 5) time spent in extracurricular activities, 6) time spent in religious activities, 7) grade average, 8) time spent in academic activities, 9) gender, and 10) grade level. Alcohol is one of the most widely used drugs by adolescents and it is imperative that social researchers study the patterns of alcohol use and misuse among youth. The subjects comprised a large representative sample of male and female students in sixth through twelfth grades who were enrolled in 26 school districts throughout Pennsylvania. The subjects were stratified by grade in school, and a systematized random selection technique which guarantees a 20% sample was used to select the sample population of 7,799 subjects from a total population of 29,930. The data collection instrument used in this study was the Primary Prevention Awareness, Attitude, and Usage Scales (Form 7) (Swisher, 1983). The data were analyzed by using the multiple-correlation regression procedure. The .05 level of significance was used for all statistical analyses. It was concluded that the self-reported alcohol use of this adolescent sample was highly correlated with the composite effects of the independent variables tested. On an individual basis, behavioral intention and school misconduct were consistently positively related to self-reported alcohol use. Time spent on religious activities was highly negatively correlated with self-reported use of alcohol. These findings suggested strong implications for individuals involved in alcohol abuse prevention. The development of effective means of preventing or treating adolescent alcohol abuse necessitates a comprehensive understanding of the potential factors leading to the drinking behavior as well as an analysis of the correlates of drinking. To this end, the Primary Prevention Awareness, Attitude, and Usage Scales (Form 7) (Swisher, 1983) can serve as an excellent needs assessment and evaluative tool to identify specific characteristics of relevance within a particular population. These characteristics could then be considered in the development of alcohol prevention programs.

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Friday, April 8
2:00-3:15 p.m.

TITLE: Patterns and Prevalence of Smokeless Tobacco Use by High School Seniors in the State of New York

PROBLEM: The problem of this study was to identify patterns and prevalence of smokeless tobacco use by high school seniors in the State of New York. Regionally, the investigation of smokeless tobacco use has predominantly been completed in the Southeast, Southwest, and Midwest. Inadequate data are available in the Northeast. The Surgeon General reported that more research was necessary to identify patterns and prevalence of smokeless tobacco use, particularly among adolescents. Finally, it was determined that a more rigorous research design was needed regarding smokeless tobacco investigation.

PROCEDURES: This study randomly selected schools for participation, while also dichotomizing patterns and prevalence of smokeless tobacco use by two predominant forms: chewing tobacco and snuff. An anonymous and confidential collection of data regarding smokeless tobacco use was completed through administration of a questionnaire by classroom teachers to 1,830 high school seniors in the State of New York. Data were analyzed descriptively.

SUMMARY OF FINDINGS: The sample had favorable characteristics of the population, thereby allowing for generalization of the results across the state. The use of smokeless tobacco by high school seniors in the State of New York is a practice of predominantly rural males. No significant difference was found between prevalence of chewing tobacco and snuff use in this sample. The use of smokeless tobacco appears to occur most often in social contexts. Compared to smokeless tobacco, cigarette smoking (23.5 percent), is the tobacco form of choice by high school seniors in the State of New York. The male prevalence of smokeless tobacco use (11.3 percent) in this study was comparable to that of previous research. The importance of this finding is that investigators have frequently suggested that smokeless tobacco use is not common in the Northeast part of the United States. As a result, health educators must continue to monitor this habit, while identifying effective prevention techniques.

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Friday, April 8
2:00-3:15 p.m.

Kau, M., Grad Student and Airhihenbuwa, C., Assistant Professor, Health Education Department, The Pennsylvania State University, University Park, PA

ASSESSMENT OF CONTRACEPTIVE KNOWLEDGE AND BEHAVIOR OF GIRLS AGED 13-18 IN THE MOLOPO REGION OF BOPHUTHATSWANA

It is estimated that 10 to 15 percent of births world-wide are to adolescent mothers. In the Molopo Regions of Bophuthatswana adolescent pregnancy continues to be a public health problem. The purpose of this study was to determine the extent and type of contraceptive use among female students aged 13-18 in the Molopo Region. Cluster sampling was used to identify 30 clusters from which a total random sample of 210 females aged 13-18 were drawn. Personal interviews with each individual in the sample were conducted thus none of those selected refused to participate. The mean age of the sample was 15.2 with a mean age at menarche of 13.4 years. More than 80% of them had a general knowledge about contraceptives that had been obtained from a variety of sources. Although over 50% of the girls were sexually active, only 31% reported that they used any form of contraception. Of the 2.2% that reported that they had been pregnant and had a child none had used contraceptives. The results of this study will be used to develop a school/community health education program for the Molopo Region of Bophuthatswana.

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Friday, April 8
2:00-3:15 p.m.

EATING DISORDERS AMONG FEMALE COLLEGE ATHLETES. Joanne S. Chopak, Mary E. Taylor, The Pennsylvania State University.

The purpose of this study was to determine the relationship between eating disorder attitudes and behaviors of selected female varsity college athletes. An increasing number of health personnel, have become aware of anorexia and bulimia among their student athletes. The significant of this study is relevant to health educators, coaches and other health personnel who play a significant role in the athlete's life. A total of 82 athletes from seven different female varsity teams comprised the sample population. The Eating Disorder Inventory, EDI and The Survey of Eating Disorders Among Athletes, SEDA were the instruments utilized to collect data. A demographic section was also included. Mean scores and standard deviations were obtained for both instruments. Chi square analysis was used to assess the relationship between several demographic variables and the incidence of eating disorders. A oneway ANOVA was also employed to determine if significant differences existed between teams. A total of 24 athletes had a previous eating disorder and 12 athletes presently had one. Significant differences were found between three teams on one part of the EDI and one part of the SEDA. Eating disorders do occur among athlete populations. The most often cited reason for this was the need to reach aesthetic beauty ideals of the sport. If less emphasis was placed on this, the probability that eating disorders among athletes would be reduced is increased greatly. Results from the study may be used to help develop preventive and early intervention programs, thus more effectively reducing eating disorders in the athlete population.

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Friday, April 8
2:00-3:15 p.m.

AN EIGHT YEAR ANALYSIS OF THE TEL-MED INFORMATION SYSTEM.

Larry K. Olsen, MinQi Wang, Richard W. St. Pierre, The Pennsylvania State University, Lois Michaels, Mary Ann Guzzardi, Health Education Center.

Initiated in May, 1976, the TEL-MED system is a taped, telephone information system that is a joint program of the Health Education Center and the Allegheny County Bar Association in Pittsburgh, Pennsylvania. This information system consists of a library of tapes that include up-to-date information on a wide variety of health and law-related topical areas. The information system is accessed by telephone from residents, not only of the greater Pittsburgh area, but also from neighboring states as well. The purpose of this information system is to provide the general public with a convenient way of accessing health and medical information. Requestors can dial the telephone and ask for a particular tape to be placed into the system so that they can listen to the information that is presented. The system consists of a total of 25 telephone input lines that can be accessed through one general telephone number. From 1980 through 1987 data have been collected on a daily basis. The purpose of this study is to examine the pattern of the health and medical information requests during these years, and offer recommendations to others who might be considering the establishment of similar systems. Analysis of the data showed that between January 1, 1980 and December 31, 1986, over 1.8 million telephone calls for information were received. Trends that were noted showed that as health and legal problems were printed in the media, the calls relative to those issues increased. As the various problems were abated, calls shifted to other information of a more general nature. Specific trends over years since the AIDS epidemic became known to the general public, resulted in a significant increase in the number of calls requesting information related to AIDS and AIDS related issues (HIV transmission, condom use, both heterosexual and homosexual transmission, etc.). The presentation will focus on how such systems can assist those in community and school health programs in updating their information base so that the public has swift access to current health information.

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Friday, April 8
2:00-3:15 p.m.

EVALUATION OF EMERGENCY CARE KNOWLEDGE AND APPLICATION.

Bobby Guinn, Pan American University.

The purpose of this study was to determine, among lay students, retention of emergency care knowledge and level of correctness in the performance of first aid skills. Subjects were 978 individuals who received American Red Cross instruction and certification in standard first aid procedure from the investigator during the period of May, 1980 through May, 1986. Data were gathered through a self-report instrument covering the twelve content areas necessary for certification: wounds, shock, respiratory emergency, choking, poisoning, drugs, burns, frostbite, heat maladies, sudden illness, bone and joint injuries, and emergency rescue. Age, sex, and certification status were also included. The item used to operationalize the instrument was one that asked the respondent if he or she had given emergency care for any of the 12 areas since course completion. If the response was No, the survey was completed, if Yes, the respondent was to describe what was done as well as indicate their feelings as to how correct their procedure was. Level of correctness was ascertained by comparison with ARC first aid criteria. The mailing return rate was 698 or 71.4 percent, of which 226 indicated they had provided emergency care. Results indicated the percentage of respondents administering correct care was highest in wounds (85%), bone and joint injuries (73%), and sudden illness (71%) with the lowest being frostbite (7%), poisoning (21%), and drugs (29%). Cross tabulation and Chi-square analysis revealed correctness of care significantly related to time period since instruction with retention the greatest in choking and bone and joint injuries and the least in shock and poisoning. Furthermore, the respondent's perception of the appropriateness of the care given was significantly related to how correct his or her procedure actually was.

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Friday, April 8
2:00-3:15 p.m.

RADIAL KERATOTOMY AND TRAFFIC SAFETY

Alex Waigandt, University of Missouri-Columbia

Radial keratotomy has been performed in the United States for more than 10 years and over a hundred thousand myopes have had the procedure conducted on their eyes. The medical community has expressed concern about the procedure but research findings indicate that RK is a safe, effective procedure for reducing myopia. Despite this, many patients report night vision problems post-surgery. The purpose of this study was to evaluate night driving vision with and without glare following RK surgery. The study was a prospective evaluation of radial keratotomy in which acuities, refractive status, keratometry, contrast sensitivity and twilight/scotopic vision were determined. The study was a repeated measures, pre-test/post-test research design utilizing radial keratotomy patients before treatment and at three months post-treatment. The range in age of the patients was 27 years (the youngest was 24 years and the oldest was 51) with an average of approximately 35 years (Mean=34.943, Standard Deviation=7.749). The analysis of the data was conducted on 70 eyes (32 right eyes and 38 left eyes) each of which yielded measures on 34 variables. The variables were analyzed by means of the MANOVA (Hotellings T^2) and appropriate follow-up tests. Additionally, non-parametric analyses were conducted where the data warranted. In general this study's findings were consistent with respect to acuities, refractive status, keratometry and contrast sensitivity with those previously reported. However, the Rodenstock Nyktometer had not previously been used to test twilight/scotopic vision in RK patients. The Rodenstock Nyktometer allows the researcher to simulate night driving conditions with the presence of headlights of an oncoming car. It was found that the RK patients' ability to discriminate targets under low illumination in the presence of glare was decreased by a factor of over two and a half. These results coincide with subjective complaints of glare commonly reported by radial keratotomy patients.

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Friday, April 8
2:00-3:15 p.m.

THE REMEDIATION MANUAL TESTING FOR THE COMPREHENSIVE LEISURE RATING SCALE (CLEIRS). Jaclyn A. Card, University of Missouri-Columbia.

The purpose of this study was to test the effectiveness of the remediation manual used as a companion to the Comprehensive Leisure Rating Scale (CLEIRS). CLEIRS is a leisure behavior assessment intrument that measures the degree of leisure independence of aged, mentally ill clients residing in nursing homes. CLEIRS has been tested for validity and reliability over four years and results indicate that it is both valid and reliable. But in order for CLEIRS to be useable a remediation manual was needed so that therapeutic recreation practitioners would have a guide on how to move clients along the continuum from perceived helplessness (dependence) to perceived freedom (independence). The manual that was developed focuses on the therapist-client interactions which occur during the process of selected recreational activities. These interactions are designed to help clients develop patterns for attributing causes of success to freedom in leisure. Little research exists on the effects of one-on-one interaction between a recreation therapist and a client. Practitioners feel that one-on-one is the most effective method of improving independence in leisure but no studies exist to support the feeling. The manual was tested by a therapeutic recreation specialist employed full time in a nursing home. Four clients (two in the experimental group and two in the control group) were randomly chosen to participate in the study and the therapist administered CLEIRS to the clients to determine their leisure independence. The remediation manual methods were implemented on the experimental group and the control group received the normally scheduled group activities with no one-on-one therapist-client interaction. Clients were again assessed using CLEIRS one month following implementation of the experiment. Results indicated that therapist-client interactions during recreational activities enhance independence in leisure more than clients participating in large group activities. CLEIRS and the manual should be distributed to practitioners in various nursing homes so that further testing of its usefulness can be documented.

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Saturday, April 9
9:00-10:15 a.m.

THE RELATIONSHIP OF RECREATION SERVICES, AGENCY CHARACTERISTICS, AND RECREATION DIRECTORS QUALIFICATIONS IN AGENCIES FUNDED BY MISSOURI SENATE BILL 40. Cris Rodriguez, University of Missouri-Columbia

The purpose of this study was to investigate the relationship between the qualifications of recreation directors and agency characteristics with the quality of therapeutic recreation services. All the agencies and directors were from counties who have passed Senate Bill 40, a bill which enables taxes to be collected and used to provide services for mentally retarded and developmentally disabled individuals living in the community. Many counties which have passed this bill have not developed recreation services for clients living in their counties. The results of this study provide information which will help to develop quality recreation services in those counties not yet offering recreation services. Variables for the qualifications of the recreation directors included; educational background, professional affiliation, national certification, and years of experience in recreation. Variables for agency characteristics included amount of money allotted for recreation programming, location of the county (rural/urban), client-staff ratio and other related services offered by the agency. The quality of services was determined by the National Therapeutic Recreation Standards for quality recreation services which are designed for all types of recreational settings. These standards include; scope of services, objectives, individual treatment/program plan, documentation, scheduling of services and ethical practices. The results indicated that the qualifications of the recreation directors have a positive relationship with the quality of therapeutic recreation services. It was also determined that agency characteristics have a positive relationship with the quality of therapeutic recreation services, and that agency characteristics are related to the qualifications of the recreation director.

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Saturday, April 9
9:00-10:15 a.m.

AN EXAMINATION OF THE INTRAPRENEURIAL PROCESS IN MUNICIPAL LEISURE SERVICES. Emilyn Sheffield, University of Missouri.

Despite a shift to multidimensional theories of entrepreneurship (Backman, 1983; Carland et al., 1984; Kitzner, 1983), innovation remains the heart of the entrepreneurial act. Intrapreneuring, or acting in an entrepreneurial manner within an organization, has been espoused as a proactive and futuristic management style. This, in turn, has engendered great interest in the relationship between organization and intrapreneur (Crompton, 1983; Pinchot, 1985; Stevenson & Gumpert, 1985). Largely lacking has been research on intrapreneurial behavior in recreation and leisure services. The purpose of this study was to examine the role of a municipal recreation agency director in the development and implementation of a programming innovation. The case study research strategy was utilized because it allows an investigator to examine a contemporary phenomenon in its real life context (Yin, 1984). Data collection involved use of structured interviews with principal individuals including the agency director, city officials, program staff and a co-sponsoring entrepreneur. Additionally, by employing a conceptual framework built from intrapreneurial research, a thorough content analysis of organizational files and documents provided support and clarification of interview data. Finally-validation of major findings was achieved through use of an evaluation protocol (Lee, 1985) which employed the criteria of falsifiability, logical consistency and explanatory fit. The findings of this investigation are presented in three categories: agency director as intrapreneur, barriers to innovation, and new findings. 1) The agency director exhibited vision, tolerance of ambiguity, ability to cross traditional organizational boundaries, strong communication skills, and a willingness to circumvent organizational barriers to innovation. 2) Project novelty (first municipal skateboard camp), product liability concerns, program co-sponsorship and inter-agency communication were among the barriers to innovation identified in this research. 3) The director's reputation and the role of serendipity emerged as additions to existing intrapreneurial theory. These findings offer an example of successful intrapreneurship within the municipal recreation sector and make explicit several issues critical to the development and implementation of innovative programs.

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Saturday, April 9
9:00-10:15 a.m.

GENDER DIFFERENCES IN COMPLEXITY OF PLAY PATTERNS. Luanne L. Herman, Arizona State University.

The purpose of this study was to identify gender differences in the complexity of play behavior of ten and eleven year old boys and girls. Subjects were in the fifth grade at two metropolitan schools in Phoenix, Arizona. Subjects were asked to record play activities participated in on weekdays and weekends in diary format. The diary questionnaire asked for the nature of each activity, the number of participants involved, and the duration of that particular activity. Activities were then scored according to six complexity dimensions. 1) number of participants involved, 2) number and specificity of rules, 3) amount of role differentiation among players, 4) level of player interdependence, 5) explicitness of a common goal, and 6) team formation. Significance of the study relates to two current issues. The first issue deals with the fact that today male and female adult roles often demand both homemaking skills and higher level managerial skills for a career. Therefore, both boys and girls need to develop nurturance and complex decision-making skills. A second growing concern has developed with regard to the status of youth fitness in our country. It seem important then, to be aware of the nature and types of activities which children in our society are engaged in during their free time because those choices foster and develop skills that carry over into adulthood. Data analysis utilized frequencies, means, and percentages. Results indicate that the amount of time both boys and girls spend in complex play activities has sharply declined in recent years. Boys still play more complex activities than girls do. The size of play groups has become smaller. Passive play activities and television watching have escalated, with girls spending more time in passive activities than boys. In summary, the most significant finding seems to be the degree to which both boys and girls have shifted away from complex play activities toward activities which are passive and unstructured in nature.

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ACTIVITY DIFFERENCES AND INDIVIDUAL ATTITUDES TOWARD THE PUBLIC AND COMMERCIAL SECTORS AS INFLUENCES ON RECREATION CHOICE BEHAVIOR.Mark E. Havitz, Iowa State University.

The roles of public sector agencies and commercial sector business is becoming an area of increasing concern and importance regarding the provision of organized recreation services (Howard and Crompton, 1984; Burch, 1985). While many studies have shown that the roles of these two sectors are essentially complementary (Lovingood and Mitchell, 1978; English and Cordell, (1987) other studies have suggested that these roles are becoming less complementary for a variety of reasons (Howard, 1985; Havitz, 1987). Individuals may have widely differing perceptions regarding the mission, effectiveness, and efficiency of the two sectors (Lipset and Schneider, 1983). Because both sectors invest considerable money and effort into the provision of recreation related services concern regarding the role of the sectors is warranted. Two recreation activities with very diverse characteristics, aerobic exercise to music and camping, were selected for inclusion in an experimental examination of the sector issue. Two diverse activities were desired because it was expected that individual attitudes regarding the roles of the public and commercial sectors would vary depending on the activity under consideration. While this was done primarily to strengthen the external validity of the results of the larger study, the contrasting results produced by the two activities provide valuable information in their own right. One hundred twenty subjects who were highly involved in the activities of camping and aerobic exercise to music made up the sample. Experimental procedures included attitude measurements, exposure to one of several treatments and an opportunity to make recreation choices. Pearson's correlations used to test the relationship between individual attitudes toward the public and commercial sectors and recreation choice decisions with regard to these two activities suggest that perceived differences do exist among consumers of recreation services. Aerobic exercise to music and camping produced differing r-scores with respect to the same question. In addition, significant differences were discovered regarding sector preferences for each activity among subjects in the study. Subjects exhibited strong preferences for commercial sector aerobics options and public sector camping options. Attitudes toward the two sectors influenced the choice behavior of the respondents. Implications for managers of programs involving these and similar activities and directions for future research are discussed.

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Saturday, April 9
9:00-10:15 a.m.

THE RELATIONSHIP BETWEEN VALUING LEISURE AND CHANGE DURING MIDDLE ADULTHOOD. Gaylene Carpenter, University of Oregon.

Researchers studying adulthood have concluded that developmental changes continuously occur throughout middle age. Change occurs because of life events, social influences, and reassessment of traditionally held values related predominately to family and career. Another well accepted value in contemporary society is leisure, and yet this value has not been examined in the developmental literature to the same degree as has family and career. The purpose of this study was to examine the relationship between valuing leisure and change during middle adulthood. That is, does the value leisure fluctuate when adults perceive they are experiencing positive or negative life change. A convenience sample of middle age adults was utilized in this exploratory phase of longitudinal studies of leisure during middle adulthood. Subjects perception of leisure value was measured by the Leisure Ethic Scale (Crandall and Slivken). Subjects' change experienced over the previous twelve months was measured by the Life Events Scale (Holmes and Rahe). Of the thirty-four respondents, fifteen were male and nineteen were female. Subjects' average age was 41.5. Results indicated that respondents had positive scores on the Leisure Ethic Scale ($\bar{x}$ 31.5), thus indicating that leisure was valued. The results of Pearson Correlation showed a relationship between leisure ethic and the impact of life events (r^2 = .276, p = .06). Results suggest additional study of this relationship is warranted.

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Saturday, April 9
9:00-10:15 a.m.

MICROCOMPUTER USE: A STUDY OF THERAPEUTIC RECREATION PROFESSIONAL PREPARATION PROGRAMS AND THERAPEUTIC RECREATION PRACTITIONERS

Jane E. Kaufman, University of Northern Colorado; W.B. (Terry) Kinney, Temple University

Society currently has the ability to apply high technology to the management of information systems, and in some sectors that has been implemented effectively. The refinement of microcomputers, specifically, places the benefits of that technology within reach of disciplines that previously could not afford access to technological advances. One such discipline is therapeutic recreation. While the scope of microcomputer applications in therapeutic recreation appears to have expanded, there is a dearth of basic "state of the art" information available on which decisions can be based. Therefore, the present study was conducted. The purposes were to determine the current and perceived future use of microcomputers in the delivery of therapeutic recreation services; to determine the current efforts of therapeutic recreation professional preparation programs in colleges and universities for developing computer literacy and user skills in students; and to determine if any discrepancy existed between professional preparation of therapeutic recreation students and microcomputer skills required by therapeutic recreation practitioners. Two questionnaires, one directed toward practitioners who were members of the National Therapeutic Recreation Society (N=983) and the other toward academicians in therapeutic recreation professional preparation programs (N=89), were developed and mailed to ascertain the microcomputer information. The findings indicate that: (1) few therapeutic recreation departments (18.7%) currently use microcomputers while 33.5% do have an interest in microcomputer usage and 23.6% indicated "no interest" in development; (2) in the area of professional preparation, at the undergraduate and graduate levels, an increase in need for microcomputer skills applied to therapeutic recreation competencies was indicated by academicians; and (3) it appeared that academicians perceived a greater need and use of microcomputers than indicated by practitioners involved in the delivery of therapeutic recreation service. The results of this study have implications for the development of microcomputer skills and technology for both therapeutic recreation students in professional preparation programs and therapeutic recreation practitioners.

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Saturday, April 9
9:00-10:15 a.m.

A NATIONAL STUDY OF SALARIES AND BENEFITS FOR RECREATION AND LEISURE SERVICES INTERNSHIPS. J. Thomas Chesnutt, University of Alabama; Dave Miller, California State University-Fresno; George Lowrey, University of Illinois at Urbana-Champaign.

The internship is an important part of a student's educational preparation for a career in the leisure services profession. Internships are generally three months in length and universities often stipulate that internships may not take place in the student's home town or the city in which the university is located. Not only must the student pay regular tuition costs, but often the student incurs additional room and board expenses. Concern exists that students may make internship selections based primarily upon financial needs, thereby limiting their internship opportunities. The purpose of this study was to determine the salary and benefits received by undergraduate leisure service majors throughout the country during internships. A list of agencies utilizing interns was obtained from universities with recreation and leisure service academic programs. The subjects were the 375 recreation and leisure service agencies that responded to a mailed questionnaire concerning salary and benefits. The data were analyzed using frequencies and chi square procedures. The agencies were classified as: public (54%), private-nonprofit (34%), and commercial (11%). A disappointing 57% of the agencies provided no remuneration to interns. Of those which did provide a salary or stipend, the mean was $305 per month and 47% provided less than $200 a month. While there were no significant differences in remuneration based upon type of agency, there was a significant difference based upon geographic regions. The Northeast was least likely and the Upper Midwest most likely to pay interns. Few benefits were provided. Those most often provided were: liability insurance (45%), conference expenses (27%), and meals (22%). The results indicated that recreation and leisure services interns receive poor remuneration and benefits. The implications are that students are increasingly likely to select internship sites primarily based upon financial factors rather than learning or development rationale. Unless benefits and salaries can be increased, the quality of the internship learning experience will deteriorate.

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THE PRISMATIC MODEL FOR STYLE ANALYSIS IN DANCE. Betsey Goodling Gibbons, Texas Woman's University.

The purpose of the study was to develop a model to illustrate how the performance style of the performer and the style of the dance work combine to produce a unique phenomenon. Research methods involved studying the writings of aestheticians, critics, choreographers and dancers, studying the comprehensive conceptual system for analyzing and recording movement developed by Rudolf Laban and his followers, and reviewing the literature involving research studies using different aspects of Laban Movement Analysis. As a result, four rather than two interacting layers of style were identified: the style of the performer, the style of the work, the style of the choreographer, and the style of the genre. The prism was selected as a model for showing separation of these layers for study and analysis, and how the layers combine to produce the white-light phenomenon of the unique dance performance. Use of the prism was supported by research into spectroscopy. The importance of the study lies in the fact that critics, choreographers, notators, and dance scholars have often addressed the topic of style analysis in dance, discussing issues such as providing stylistic guidelines for assuring authenticity in reconstructions, documenting and tracing the changes in movement style from one "generation" of dancers to the next, the impact that personal performance style has on a dance work of art both in a single performance and during the evolution of that work over time, and the need to study dances as compositions and as performances. The prismatic model facilitates understanding of the interactions between the style of the dance work itself, the style of the choreographer who created it, the style of the genre in which it was created, and the style of the dancer who gives it utterance. This paper will include a description and explanation of the prismatic model, how it is supported by writings of aestheticians and critics as well as research studies which analyze and document each of these four layers, and will discuss how application of the model can illustrate the complex interaction of style in dance and the implications for researching, choreographing, reconstructing, performing, and appreciating dance works.

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Saturday, April 9
9:00-10:15 a.m.

THE INDIAN CLASSICAL DANCE EXPERIENCE IN CANADA: INTERPRETED THROUGH THE ANTHROPOLOGY OF PLAY. Jean Cunningham, University of British Columbia

Contemporary anthropology has some new and challenging ideas on play which frequently embrace the arts. No longer seen as childhood's rehearsal for later life or as the opposite of work, play is conceived as a mode of behavior which involves transformation, role-play and self-definition. It is a phenomenon which frames and interprets rather than imitates the world. All these characteristics can be applied to dance and this paper argues that for certain mature second-generation South Asian immigrants in Canada, the dance is an important form of play, as defined above. The subjects were student participants in a school that teaches India's Bharat Natyam. Methodology included participant observation and interviews. From analysis of the dance itself, and from students' own perceptions and metaphors, the study concludes that (1) Bharat Natyam defines the participants' Indianess (2) interprets their own femininity as Indian women and (3) frames and endorses the Indian part of their South Asian - Canadian duality.

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Saturday, April 9
9:00-10:15 a.m.

A COMPUTERIZED METHODOLOGY FOR DETERMINING THE MOVEMENT PROFILE OF A DANCER USING LABAN MOVEMENT ANALYSIS. Mary A. Brennan and Gordon R. Stephenson, University of Wisconsin-Madison.

The purpose of this study was to determine the movement profile of a single subject over four self-choreographed solo dance studies using a newly developed methodology for recording and analyzing observational data. Using categories primarily derived from Laban Movement Analysis seven variables were identified as key components in the determination of the movement profile (Impulses, Body Actions, Shape, Flow Effort, Weight Effort, Space Effort, Time Effort). For each variable one pass of the videotaped dance was viewed by two trained observers and coded on a computer keyboard with software (SSRIN) which records events accurately to 1/20th of a second. Interobserver agreement was achieved. The data for each variable were processed through PLEXYN an observation language program which provides a syntax for the entered code character strings. Each observed pass created a separate computer file for each variable. The computer program MERGOR was used to combine files by merging the seven variable files into one file. This combined file was processed through BLOKDATA, a program which graphs in vertical columns all movement elements occurring at each one second interval. This identifies the occurrence at each second of single elements or element combinations. The SUMARY program gave a numerical count of the instances of each element. Using SLICDATA element clusters were identified by grouping unique combinations in chronological order by seconds. The result in using these programs was a time based profile of the dancer's movement characteristics as they occur singly or in combination. The results show a frequent use of bound flow, and moderate use of free flow, direct space, and strong weight. Arc-like movement was the most frequently used shape characteristic. The mobile and dream states were the predominent two-element effort combinations and the passion and vision drives were the primary three-element effort groupings. The data reveal that the same elements were predominent in all four studies indicating an habitual use of certain movement characteristics.

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AEROBIC DANCE VIEWED THROUGH LABAN'S FRAMEWORK OF SPACE HARMONY.
Billie Lepczyk, Virginia Polytechnic Institute and State University.

The purpose of this study was to view aerobic dance-exercise through the space harmony framework devised by Rudolf Laban. This perspective concerns the spatial attributes of movement: forms, pathways, and relationships of spatial tensions. The three aerobic programs selected for observation offered instruction for adult participants and differed mainly in the sequence of the workout. One program placed the calisthenics component before the aerobics component; the second program reversed the order; and the third program allowed the individual instructors to set the sequence and also to include structured combinations in addition to freestyle within the aerobics component. The findings of the study indicated that in each of the programs, the torso mass was greatly involved in creating a range of spatial pathways and patterns during the calisthenics component; however, during the aerobics component, the movement was predominantly oriented to dimensions and the torso was rarely involved in the patterns oriented to planes or diagonals. The few planal movements involving the entire body mass included 'jumping jacks' which is oriented to the vertical plane, and 'forward lunges' with the torso and arms slanted through the diameter of the sagittal plane. The few movements creating diagonal tension through the torso mass included the 'elbow to knee' and 'twisted lunges' where the torso and arm(s) slant off the vertical. The implications for this study suggest that an increase of movements involving the torso in planal and diagonal pathways could be designed for the aerobics component if preceded by the calisthenics component. Such movements could be derived from work actions and modified sports rather than the abstract art form of modern dance.

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EFFECTS OF ACADEMIC LEARNING TIME-PHYSICAL EDUCATION (ALT-PE) SUPERVISORY FEEDBACK ON THE RELATIONSHIP BETWEEN PERCEIVED AND OBSERVED STUDENTS' BEHAVIORS. V. Mancini, D. Wuest, D. O'Brien, & P. Frye, Ithaca College.

This study compared the effects of conventional (CSF) and systematic supervisory feedback (SSF) using ALT-PE (Siedentop, Tousignant, & Parker, 1982) on the accuracy of teachers' perceptions of their students' behaviors. Thirty preservice physical educators, randomly assigned to treatment and control groups, taught three micropeer lessons which were videotaped and coded using ALT-PE. Intraobserver agreement ranged from 94.7-100%. Prior to and after each class, each teacher completed the Teachers' Questionnaire on Students' Activities (TQSA). The TQSA, based on the ALT-PE categories, measured teachers' perceptions of the students' behaviors. Teachers in both groups received CSF while viewing their tapes. Treatment group teachers also received SSF based on the ALT-PE codings of their tapes as well as a comparison of their TQSA post-class estimates and the observed percentages for students' behaviors obtained from the ALT-PE codings. The third videotape and TQSA post-class estimates were used for data analysis. To determine the relationship between perceived (TQSA) and observed (ALT-PE) behaviors canonical correlations were performed. For the treatment group, all variables at both the context level (CXTL) and learner involvement level (LIL) showed significant correlations ($p < .05$). No significant correlations were found for the control group. A one-tailed Fisher's z test on all the variables led to identification of a significant difference in the relationship between perceived and observed students' behaviors for CSF and SSF groups. MANOVA revealed significant differences in behaviors between both groups at the CXTL [$F(5,24) = 4.89$] and the LIL [$F(5,24) = 17.43$], ($p < .05$). Discriminant function analysis revealed at the CXTL transition accounted for 54.8% and at the LIL ALT-PE accounted for 34.5% of the between-group variance. Univariate ANOVA indicated that at the CXTL transition was the only variable to independently contribute to the significant between-group difference. At the LIL, waiting, cognitive, on-task, and ALT-PE each independently contributed to the significant between-group difference. SSF teachers' students accrued more ALT-PE, whereas CSF teachers' students spent more time in transition, waiting, cognitive, and on-task behaviors. It was concluded that teachers who received SSF were more accurate in estimating their students' behaviors and were more effective with their students accruing more ALT-PE.

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Saturday, April 9
10:45-12:00 noon

A COMPARISON OF THE ACADEMIC LEARNING TIME-PHYSICAL EDUCATION (ALT-PE) OF ITINERANT AND NONITINERANT PHYSICAL EDUCATORS' STUDENTS. K. Pinkham, University of Massachusetts, V. Mancini, D. Wuest, and P. Frye, Ithaca College.

In a job satisfaction survey of 98 itinerant (IT) physical educators by Rog and Pinkham (1987), it was reported that the restricted time frame and conditions in which many itinerants worked made it difficult for them to develop motor skills in their students. This study was conducted to investigate the teaching behaviors of itinerants. Specifically, the ALT-PE of IT and nonitinerant (NIT) elementary physical educators' students was compared. Twenty IT and 20 NIT physical educators, 10 males and 10 females in each group, were videotaped teaching three classes. The 120 videotapes were coded by a trained observer using the ALT-PE instrument (Siedentop, Tousignant, & Parker, 1982). Intraobserver agreement ranged from 91.7% to 100%. MANOVAs, performed on the context level (CXTL) and learner involvement level (LIL) variables, revealed significant differences in behaviors between both groups at the CXTL [$F(9,30) = 9.90$] and LIL [$F(6,33) = 20.67$], $p < .05$. Significant ANOVA results ($p < .05$) indicated that IT teachers' students spent more time in transition and management activities and exhibited more waiting, off-task, and on-task behaviors; however, NIT teachers students' received more information about technique, engaged in more practice and fitness activities, and accrued more ALT-PE. Discriminant function analysis indicated that at the CXTL management, followed by strategy and transition, were the greatest contributors to the between-group difference. At the LIL, wait and off-task were the greatest contributors to this difference, and motor appropriate (ALT-PE) behavior was only fifth in importance. However, when steps were taken to counteract apparent multicollinearity, management was still the highest contributor at the CXTL and ALT-PE became the most important at the LIL. It was concluded IT physical educators were less effective in organizing their classes and that their students' achieved less, as measured by ALT-PE, than students of NIT teachers. These findings support the doubts expressed by IT physical educators in Rog and Pinkham's study concerning their ability to develop their students' motor skills. Further investigation into the working conditions, job satisfaction, and teaching behaviors of IT physical educators is needed.

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10:45-12:00 noon

THE EFFECTS OF MODIFICATION OF TEACHER BEHAVIOR ON THE ACADEMIC LEARNING TIME OF SELECTED STUDENTS IN PHYSICAL EDUCATION.

Deborah B. Moore

The purpose of this study was to determine if specific teaching behaviors of inservice physical education teachers could be changed in such a way so as to increase student academic learning time in physical education, (ALT-PE). ALT-PE was defined as time on task with a high probablility of success. Subjects were three inservice physical education teachers at the elementary, middle and secondary levels with 10, 1 and 8 years of experience respectively. It was hypothesized that variables such as frequent and prolonged managerial episodes, high rates of student non-engagement and low rates of teacher feedback might be associated with low rates of ALT-PE. Data were collected using the ALT-PE Teacher Behavior Observation System, an interval recording system, on teacher behaviors and the ALT-PE for three selected students in each teacher's class. Intervention consisted of a series of clinics focusing on suggestions for changing teacher behaviors and ways to implement those changes, and daily feedback from the investigator. A multiple baseline design across behaviors was utilized to show causality between the treatment and the changes in managerial time, student non-engagement and feedback. For teachers 1 and 2 intervention was successful in decreasing managerial time from a baseline mean (% of occurrence) of 26.1 to 6.3 and from 11.7 to 4.1 respectively, and in increasing feedback from 12.1 to 26.2 and from 13.3 to 38.7 respectively. All three teachers showed significant decreases in student non-engagement from 21.1 to 16 for teacher 1,from 36 to 13.8 for teacher 2 and from 33.4 to 10.4 for teacher 3. Though no statement of causality can be made, the student variable ALT-PE increased from 17.5 to 39.2 under teacher 1, from 12.6 to 37.3 under teacher 2 and from 23 to 42.6 under teacher 3. This study demonstrated that instruction and daily feedback to teachers were effective in changing teacher behaviors. In noting the increase in the student variable ALT-PE, it also indicated that student achievement improved, given the assumption that this variable is related to student achievement.

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AN ANALYSIS AND IDENTIFICATION OF THE ROUTINE TASKS OF TEACHING AMONG JUNIOR AND SENIOR HIGH SCHOOL PHYSICAL EDUCATORS. Ron E. McBride, University of Idaho & Charles H. Imwold, Florida State University.

Research on teaching has identified a host of teacher behaviors associated with increases in student learning. Little information exists, however, on variables that may affect teacher behavior. To date there are no published systematic data on the routine tasks p.e. teachers face in their environment nor on the possible effects these tasks may have on subsequent teacher behavior. This study investigated the first variable and sought to: 1) identify and classify the kinds of routine tasks physical educators encounter and, 2) ascertain any differences by gender or teaching level (junior vs senior high) on identified tasks. Initially, a random sample of 100 physical educators was asked to identify five routine tasks of teaching encountered in their environment that either impinged or prevented them from attaining their teaching goals. From the 500 statements collected, inductive analysis (Patton, 1980) was used to identify ten routine tasks. A 10-item questionnaire with a five-point likert scale was then generated and sent to physical educators across the country. Responses were received from 302 junior and senior high school p.e. teachers (return rate=59%). To identify interrelationships among the responses, the data were subjected to a principal components factor analysis and rotated to the varimax criterion. Three distinct factor clusters emerged. They were labeled, Administrative, Program, and Extraneous Variables (Hassles). The first factor consisted of items about class size, lack of facilities and equipment, poor scheduling of classes, and little administrative support. Factor two was composed of items relating to a lack of continuity in the p.e. program, grading policy, and conflicts of interest between teachers and coaches. The final factor listed dealing with non-dressers and legal liability. Differences between gender and teaching level was determined using the General Linear Model (GLM) procedure (SAS, 1985). Factor 1 (Administrative) and Factor 3 (Extraneous Variables) produced no significant differences ($p>.05$), but Factor 2 (Program) revealed a significant difference by level ($p<.01$). Interestingly, senior high school teachers recorded higher scores on the items dealing with the physical education program. Further investigation is recommended to account for this finding. Similarly, further study is needed to ascertain how, or if, the identified task items might relate to subsequent teacher behaviors in the gymnasium.

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Saturday, April 9
10:45-12:00 noon

APPLICATION OF THE TEACHING FEEDBACK MODEL ON TEACHER EFFECTIVENESS AND STUDENT LEARNING IN UNIVERSITY LEVEL PHYSICAL EDUCATION THEORY CLASSES. Thomas Wandzilak and Lynn Mortensen, University of Nebraska-Lincoln.

Little is known about documenting student learning and teacher-effectiveness in an objective manner at the post-secondary level. In order for educators to improve, evaluation of the teaching process and of what is learned by students is essential. This study was conducted to determine teaching patterns, student behaviors, time utilization, questioning patterns and the degree to which student learning takes place in physical education theory classes in a college setting through the Teaching Feedback Model (TFM), and to apply these data to a faculty development process.

Unlike other models on teacher effectiveness, the TFM integrates systematic observation of student and teacher behaviors with an analysis of student achievement. The model assists teachers by identifying strengths and weaknesses in a quantitative, objective manner. Based on the profiles established, faculty members can document their effectiveness by promoting student learning towards desired objectives and can initiate steps to improve the quality of what transpires in class. The model assesses student learning and time utilization for a particular lesson and provides the instructor with immediate feedback that documents teaching effectiveness.

Nine faculty members from a large mid-western university physical education teacher preparation program are participating in this longitudinal, faculty development study. Each faculty member attended a two-hour workshop where the concepts of the model were discussed. Throughout the next two semesters, a variety of student and teacher behaviors were observed and coded. After each class, a meeting was held with the colleague to discuss the session and suggestions for change were made. The model has proven to be effective in helping faculty to identify a class profile and has helped them increase wait time, decrease management time, remove pet words, improve the quality of questions, and has led to the use of a variety of learning methods. Information provided from the study has been used in follow-up classes to enhance student learning.

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THE EFFECT OF THE STUDENT TEACHING EXPERIENCE ON INSTRUCTIONAL STYLES OF PRESERVICE PHYSICAL EDUCATION MAJORS.

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The purpose of this study was to examine the effects of the student teaching experience on the instructional styles of physical education majors. Instructional style is defined as the teacher's personal behavior and media used to transmit to or receive data from the learner. An understanding of how the student teaching experience affects students' instructional style ought to influence the various processes used in the training of physical education teachers. The subjects were 30 physical education student teachers and 27 physical education majors who were one semester from student teaching. A quasi experimental pretest-posttest design was used. The student teachers served as the treatment group and the non-teaching physical education majors served as the control group. The Canfield Instructional Inventory was administered to all subjects to determine their instructional style. The inventory identifies three major categories under which instructors prefer to teach; Conditions, Mode, and Influence. Validity and reliability estimates for the inventory range from .64 to .95 and .81 to .96 respectively. All subjects completed the inventory prior to student teaching as well as after its completion. They were not aware of their style results until after the conclusion of the study. The effects of the student teaching experience on the subjects' instructional style was analyzed by an analysis of covariance statistical procedure. The scores gathered prior to student teaching served as the covariate. Results of the study indicated that the student teachers differed from the control group in the Conditions and Influence categories at the $p > .05$ level of significance. Student teachers preferred more Authority and Detail but had less preference for Peer Affiliation and also felt less Responsible for student learning than their non-teaching peers. These results indicate that the student teaching experience does significantly impact student teachers' instructional style. In particular, it seems to produce a shift toward a more direct, teacher-centered style of instruction. Teacher preparation programs should provide more "realistic" teaching experiences for students in order to more fully develop the instructional style prior to the "culminating practicum".

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AN ANALYSIS OF TEACHER INSTRUCTION TIME AND TEACHER MANAGEMENT TIME BEFORE AND AFTER INTERVENTION PROGRAMS FOR PRESERVICE PHYSICAL EDUCATION MAJORS.

Cynthia Carlisle, Jeffrey Steffen and D. Allen Phillips,
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The purpose of the intervention program is to improve those behaviors believed to be important for effective teaching in the preservice physical education major prior to student teaching. It is believed by the Pedagogy Research Team at UNC that the alterable behaviors should be changed during the clinical experience of the Methods of Teaching and Measurement Block before the major is placed in a student teaching situation. All preservice physical education majors are video taped, teaching three lessons over a six week time frame. The films are analyzed using the Physical Education Teaching Assessment Instrument (PETAI) (Phillips and Carlisle, 1983; Phillips, Carlisle, Steffen and Stroot, 1986). Individual intervention programs are developed for each physical education major based on the film analysis and the expertise of the University consultant, the cooperating teachers, and the graduate assistants. The physical education major works on the recommended behavior changes and is filmed in two weeks. The entire process is repeated a second time and a third filming is administered. Data has been collected on 29 women and men preservice physical education majors to determine if individual intervention programs make a difference on the amount of time teachers are in instruction time and in management time. Ten behaviors were examined within these two categories. Results which will be presented are as follows:

Variable	Pretest $\bar{X}$	Post Test $\bar{X}$	Dependent t
Teacher Instruction Time			
Planned Presentation	14.10	15.85	.813
Response Presentation	3.82	6.02	1.602
Monitoring	48.47	48.24	-.043
Performance Feedback	5.77	9.23	2.146*
Motivation Feedback	4.09	6.78	2.462*
Teacher Management Time			
Beg/End Cla_s	4.96	3.38	-1.486
Equipment Management	2.04	.59	-2.699*
Organization	15.66	8.51	-1.948*
Behavior Management	.83	.82	-.051
Other Tasks	.48	.62	-.598

*p $<$.01

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10:45-12:00 noon

SELF-ASSESSMENT SKILLS AMONG STUDENT TEACHERS. Debra S. Berkey, Ruth Ann Meyer, Western Michigan University.

A systematic approach to teacher education postulates two basic assumptions: a.) Specific teacher skills correlate highly with effective teaching; and b.) These skills can be developed and highly refined (Siedentop, 1983). A recent investigation has indicated that a functional relationship exists between rates of specific teacher behavior and the percentage of student ALT-PE (Berkey, Wiegand & Hawkins, 1985). The purpose of this study was to examine the accuracy of self-assessment skills among student teachers. Specifically, the perceived and observed rates of teacher corrective feedback and reinforcement and the percentage of student ALT-PE, on-task and waiting time were investigated. Four student teachers (2 males/2 females) enrolled at a mid-sized public university in a mid-western state during the winter, 1987 semester served as subjects for the study. Subjects were observed six times during instruction by a university supervisor who utilized a systematic behavior observation technique. The remaining two observations were video observations utilized to determine inter-rater reliability (Sulzer-Azaroff & Mayer, 1987). Four of the observations were analyzed for the purpose of this study. Eleven teacher and eight student behaviors (Hawkins, Wiegand & Bahneman, 1983) were systematically recorded by the observer. Subjects completed self-evaluation forms projecting the percentages and rates of the 19 categories identified immediately following the observation session. Percentages and rates of each observed and perceived variable were graphed across time and subjected to visual inspection (Kazdin, 1983). Subjects significantly overestimated student ALT-PE while underestimating on-task and waiting behavior. The rate of teacher reinforcement was significantly overestimated. The estimation of the rate of corrective teacher feedback was the most accurately perceived behavior category across subjects. The self-assessment skills of all subjects improved significantly across time. This suggests that accurate self-assessment is a skill which may be developed and refined as a function of training. The results of this study indicate that, in addition to the development and refinement of specific teacher skills, teacher preparation programs must provide specific experiences facilitating accurate self-assessment skills among trainees.

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Saturday, April 9
10:45-12:00 noon

LEARNING STYLES OF PHYSICAL EDUCATION TEACHERS AND IMPLICATIONS FOR TEACHING AND TEACHER EDUCATION. Judith C. Young, University of Maryland.

The purpose of this investigation was to describe the learning styles of physical education teachers. In addition, comparisons were made of learning style by gender, preservice and inservice categories and physical education and non-physical education status. Recently, increased awareness of differences in student learning styles has generated interest in the implications of these differences for classroom learning. Strategies have been suggested to facilitate the learning of particular learning styles systematically. Kolb defined learning style in terms of the preferred perceiving and processing modes of an individual. Each of these dimensions had two components including concrete experience and abstract conceptualization for the perceiving dimension and active experimentation and reflective observation for the processing dimension. Kolb's model considered both dimensions and the components of each simultaneously which provided for the identification of four learning style composites. The Kolb Learning Style Inventory was administered to 347 subjects including preservice and inservice physical educators and non-physical educators. Physical education teachers in this study were significantly more likely to be concrete perceivers and active processors than non-physical educators. Chi-square statistics were used to examine learning style composite in relation to gender, teaching level, and subject area. Physical educators were predominantly Accomodators as classified by Kolb. Analysis of variance procedures indicated the differences between groups on the learning style component scores. There were no significant differences between preservice and inservice teachers or males and females in this study. Discussion focused on the reasons for the characteristic learning style found among the physical educators and the relation of Kolb's concept of learning style to other approaches. The implications of particular learning styles of teachers for teacher education and for implementing teaching strategies to improve instruction in K-12 physical education classes was also considered.

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Saturday, April 9
10:45-12:00 noon

A STUDY OF CHARACTERISTICS OF PRESERVICE PHYSICAL EDUCATION STUDENTS IN TAIWAN: WHY DO THEY CHOOSE TO TEACH. Lingjiin Kang, University of North Carolina - Greensboro; Karen Butt, University of North Carolina - Greensboro.

The purpose of this study was twofold: to identify/discover why undergraduate students in Taiwan chose to teach physical education, and to study characteristics of preservice physical education students in a different social and cultural context. The Jantzen (1981) questionnaire, Why College Students Choose to Teach, was administered to all 78 junior and senior physical education majors at the National Taiwan Normal University, the only official physical education teacher certification program in Taiwan. Using the above questionnaire, subjects were asked to rate, in order of preference, 16 reasons why a college student chooses to teach. Demographic data including: sex; age; year in school when the decision to teach was made; parents previous and current occupations; influences/role models that affected students decision to teach; sports competition experiences; any previous teaching experiences; and the students preference for teaching or coaching, was also collected. Using the non parametric statistic, Kendall Coefficient of Concordance, results indicated that: professional advancement; teaching as an occupation related to the field of specialization; and tenure laws which provide security of position rated highest. The lowest concordant items were: social and economic security provided by the retirement system; parents wanting the student to become a teacher; and the lowest, physical education being the natural choice because many family members were teachers. Spearman Correlation Coefficients were computed to explore the relationships between the demographic data and the sixteen items.

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10:45-12:00 noon

A COMPARISON OF TEACHING BEHAVIORS OF SPECIALIST AND NONSPECIALIST PHYSICAL EDUCATION TEACHERS. Nell Faucette, San Diego State University; Pat Patterson, San Diego State University.

The purposes of the study were to compare the teaching behaviors of elementary physical education specialists and classroom teachers (nonspecialists) while teaching physical education classes. Additionally, data were collected on student activity levels to detect similarities or differences between those taught by specialists and nonspecialists. Four specialists and seven nonspecialists were observed during a three month period using the Teacher Observation Schedule (Rushall, 1977). The group time sampling technique, Placheck recording, was used to gather data on the students' level of activity during the observed classes. Significant ($p<.01$) differences in teaching behaviors were found between specialists and nonspecialists in several categories. Specialists had significantly higher values for feedback/reward, questioning, and directing/explaining/informing but significantly lower values for monitoring/attending. Additionally, there was a significantly higher percentage of active children in classes taught by specialists. The results revealed that specialists exhibited significantly higher percentages of effective teaching behaviors.

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Saturday, April 9
10:45-12:00 noon

INTERACTIVE DECISION MAKING OF EXPERT ELEMENTARY PHYSICAL EDUCATION TEACHERS. Deborah J. Howell, University of Central Arkansas; Amelia Lee, Louisiana State University.

Recently, researchers have offered a new framework for investigating effective teaching. This framework assumes that teacher behavior is affected by teacher thoughts and decisions. However, studies to date have been conducted within laboratory settings with teachers instructing students unknown to them prior to the study. Further, class size of previous studies have ranged from four to eight students. Therefore, the purpose of this study was to describe the focus of teachers' thoughts while teaching a basketball dribbling unit to fifth grade students in the natural setting of the gymnasium. Eleven expert elementary physical educators employed by the East Baton Rouge Parish Schools served as subjects. Selection of teachers was made by the director of physical education from a subject pool of 40 teachers. Criteria of selection were yearly evaluations made by the director of physical education. One section of fifth grade students were randomly selected from each teacher's fifth grade sections. Average class size was 26 students. All instructional lessons were videotaped. Following each lesson, teachers participated in a stimulated recall interview. During the interview, teachers viewed segments of their teaching and responded to structured interview questions. Recall interviews were audiotaped and transcribed verbatim. The transcriptswere then categorized by two trained coders using an instrument developed by Housner and Griffey (1985). During recall interviews, teachers were asked to identify cues that resulted in them altering the lesson. The type and frequency of these alernative actions were recorded. Results indicated that expert teachers focused the majority of their attention on student performance (50%) and involvement (20%). Further, teachers implemented 98 of 138 alternative actions considered. The avrage number of changes was two per lesson. Of the 98 implemented actions, 84% resulted from student cues while 16% were from teacher context cues. Alternative actions implemented were decisions regarding activities (38%), instructional processes (33%), and management (29%). Results show many similarities between decision making of experts regardless of setting (gymnasium vs. laboratory) or context (gymnasium vs. classroom). However, the cues used to initiate alternative actions appear to be situation specific. Further the focus of attention (class, group, individual) is different for teachers when working with classes in the natural setting of the gym.

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Saturday, April 9
10:45-12:00 noon

RULES AND MANAGEMENT ROUTINES ESTABLISHED DURING THE FIRST WEEK OF SCHOOL: A STUDY OF EXPERT PHYSICAL EDUCATION TEACHERS. Karyn Nelson, Amelia Lee, Louisiana State University; Madge Ashy, Southeastern Louisiana University; Debbie Howell, University of Central Arkansas.

Classroom studies conducted at the beginning of the school year have emphasized establishing rules and management routines which allow instruction to proceed in a focused way. Routines are paired, scripted segments of behavior which make aspects of the class automatic. To establish instruction rather than management as the major thrust, expert teachers introduce and rehearse important routines. This research was to (1) identify the content of rules, activity structures, and critical management routines of expert physical educators, and (2) describe the actions of the teachers as the routines were established. Subjects were three expert elementary physical education teachers. The first 5 days of class at the beginning of the school year at three schools were videotaped and interviews related to the teacher's goals and expectations were conducted. The interview data and the videotapes were analyzed to identify rules, activity structures, and supporting routines. Three researchers viewed the videotapes and coded the routines, rules and activity structures occurring during the 5-day period. The identification was made on the basis of consensus among the researchers. Routines were three types: management, support, and interactive. Management routines involved student movement and non-academic interactions; support routines facilitated instructional actions; interactive routines facilitated communication between teacher and student. Categories of activity structures were permitted to emerge from the data. All three teachers spent considerable time the first week of school defining expectations for behavior, explaining procedures, and setting goals. Important management routines established related to entering the play area, stopping on a signal, moving quickly and quietly, and moving away from trouble. Support routines included getting into formation (e.g., scatter, line) for practice and distribution of equipment. Interactive routines used most often included questions with group choral response, questions with individual responses until a correct answer is given, and travel and check student response with individual feedback. These expert physical education teachers invested early teaching time to gain automatic responses from the students in behaviors necessary for a well-managed classroom.

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Saturday, April 9
10:45-12:00 noon

ROLE DEFINITIONS IN ELEMENTARY HEALTH EDUCATION: A STUDY OF TEACHERS WITH VARYING LEVELS OF EXPERTISE. Jo A. Carter, Amelia M. Lee, Louisiana State University; Karen M. Greenockle, University of Tennessee at Martin.

The objective of this research was to discover and describe differences in definitions of roles and belief systems by experienced and inexperienced teachers of elementary health education. A second objective was to identify differences in the relative priority these teachers place on the affective versus cognitive goals in health education. Novices in this study (N=10) were elementary teachers who had completed coursework for certification in health education but had no experience teaching. Then teachers were selected randomly from a pool of 80 preservice teachers at a large university. The experts (N=10) were teacher educators involved in the preparation of elementary health education teachers at regional universities. Evidence of expertise in this study included (a) at least 5 years of successful teaching experience; (b) completion of M.S. or Ph.D. degree in health science; and (c) frequent invitations to make presentations at inservice meetings. Teacher thinking about roles, beliefs and intended learning outcomes was explored by means of a 1 hour structured interview. Examples of questions are: (a) Of the various roles of a health educator, which do you consider to be the most important?; (b) Of the various goals you have in mind as a teacher of health, which ones do you think are most important?; and (c) Describe what you think a health educated child would be. All teacher responses were recorded on audiotape and transcribed verbatim. The content of the typed protocol was analyzed according to the content analysis methodology described by Borg and Gall (1979). Interrater reliability for individual scoring of both general and specific levels of the coding schemes was .90 or higher. Providing information that children can use to enhance health status was mentioned by some novice teachers, but the most dominant aspect of the novice teacher's conception of role was commitment to setting a good example. The experts' definitions of the elementary health educator's role were more detailed, linking together roles of a provider of information and a stimulator of positive attitudes. Both groups of teachers placed a high priority on the affective domain. In conclusion, the role conceptions held by novice teachers were not entirely consistent with those of experienced health professionals. If the purpose of teacher education is to change the practice of those who teach, it may be profitable to study in greater depth what Fenstermacher (1978) calls the subjectively reasonable beliefs of teachers.

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Saturday, April 9
10:45-12:00 noon

A STUDY OF TEACHER BEHAVIOR DIRECTED TOWARD INDIVIDUAL STUDENTS IN ELEMENTARY PHYSICAL EDUCATION. Dale E. DeVoe, University of Arizona.

The purpose of this study was to observe and describe the patterns of individualized teacher behavior in selected elementary school physical education classes. There is a need in the physical education profession to bridge the gap that exists between practitioners and research, by investigating and describing, in a systematic way, the events of communication between teachers and students that result in learning. A significant amount of individual teacher behavior should be desired in a physical education environment. This investigation was designed to determine relationships between the amounts and types of teacher behavior directed toward individual students, considering the variables of teacher gender, student gender and class participation. Seven physical education teachers and 356 of the students in the 14 classes (4=11, 5=3) were observed on three different occasions. The Individualized Teacher Behavior Analysis System (Lewis, 1979) was used to systematically observe and classify the behaviors as accepts feelings, praises or encourages, accepts or uses ideas, asks questions, lectures, gives directions, criticizes or justifies authority and total behavior. A total of 5,112 individualized teacher behaviors were observed. Of this total 1,397 (27.3%) were lecturing behaviors; 1,392 (27.2%) were praising or encouraging behaviors; 829 (16.2%) were directing behaviors; 491 (9.6%) were questioning behaviors; 375 (7.3%) were criticizing behaviors and 242 (4.7%) were accepting feeling behaviors. Female teachers directed more behaviors associated with accepts feelings, lecturing, gives directions and total behavior toward their students than male teachers. Male teachers directed more criticizing behaviors toward their students than female teachers. Male students received more behaviors associated with asks questions, gives directions, criticizes and total behavior from their teachers than female students. Students perceived by their teachers as high participants received more behaviors associated with praising, accepting ideas, lecturing and total behavior from their teachers than those students not perceived as high participants. In summary, a significant amount of individualized teacher behavior took place in the elementary physical education environment. In addition, students perceived as high, medium, and low participants received differential treatment from their teachers; male and female students received differential treatment from their teachers; and male and female teachers demonstrated different teacher behavior patterns. The results concerning the unequal distribution of individualized teacher behaviors suggest the need to focus greater attention on student-teacher interactions.

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Saturday, April 9
10:45-12:00 noon

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PEDAGOGICAL KNOWLEDGE DURING AN ELEMENTARY PHYSICAL EDUCATION METHODS COURSE: A PORTRAIT OF A RECEIVED KNOWER. Inez Rovegno, Hofstra University.

Studies of field-based methods courses might give insight into the understanding preservice teachers have of their teacher education and early teaching experiences. The purposes of this study were (a) to describe in depth one preservice teacher's pedagogical knowledge and attitudes during her field-based elementary physical education methods course, and (b) to describe how her knowledge and attitudes related to her actions teaching children during the course. The design of this study followed the rationale of the interpretive research paradigm. Qualitative data were collected from the following sources: (a) non-participant observations in the methods course and embedded field experiences over the entire semester, (b) non-participant observations of conferences between the preservice teacher and the instructor of the course, (c) three formal interviews, (d) informal interviews (including three of approximately 45 minutes), and (e) the preservice teacher's journals, lesson plans, examinations, and class notes. In accord with interpretive research methods, pedagogical knowledge and attitude themes and patterns of teaching actions were derived inductively from the data. The theoretical framework on the development of women's self, voice, and mind set forth by Belenky, Clinchy, Goldberger, and Tarule (1986) was then used to interpret this study. Analysis revealed that as a learner and beginning teacher the preservice teacher's perspective on knowing was based on received knowledge. As a learner the preservice teacher valued order, predictability, explicitness, expert opinions, listening to others, and being told exactly what to do. As a teacher she valued step-by-step instruction of non-linear knowledge, fairness, and authority, and tended to justify her own teaching decisions arbitrarily. She tended to describe as busywork, frustrating, confusing, and/or difficult methods course assignments that demanded reflection on teaching or relied on constructed knowledge. In learning to teach she did not listen for her own voice or turn to her ability to construct knowledge. Teacher educators might consider viewing received knowing from a developmental perspective. This framework could help teacher educators to structure methods course content to help preservice teachers look for more adequate ways of knowing and use more advanced critical thinking skills.

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Saturday, April 9
10:45-12:00 noon

AN ANALYSIS OF TEACHING BEHAVIORS OF GYMNASTIC COACHES

This study was designed to analyze the teaching behaviors of four youth gymnastic coaches during 24 practice sessions. The coaches were observed in 6practice sessions and data was collected throughout the entire observation.

A total of 27,181 teaching behaviors was coded using the Arizona State University (ASU) Observation Instrument devised by Lacy and Darst (1984). The data were collected by using a 5-second interval recording system. The data were found reliable, 92.7%, through Interobserver agreement checks.

The instrument included 13 teaching behaviors. Frequencies and percentages of time spent in each teaching behavior along with combined teaching behaviors were calculated.

The combined teaching behaviors of the four subjects indicated that 41.3% of all the subjects' acts were Instructional. The major portion of Instruction was Post-Instruction 21%. Manual Manipulation comprised 6.5% of all behaviors. Managerial behaviors and Silence consisted of 36.3% of the coaches' time. The predominant portion was devoted to Silence (33.3%). Over 9% of the teaching time consisted of Feedback, to include Praise, Scold, and Hustles. The gymnastic coaches were found to give three times as many Praises as Scolds. Positive Modeling was provided over four times as much as Negative Modeling.

The findings from this study help to initiate a pedagogical data base concerning youth sport gymnastic coaches. This study demonstrates the need for training programs for gymnastic coaches that focus on teaching effectiveness.

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Saturday, April 9
10:45-12:00 noon

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A COMPARISON OF BEHAVIORS IN PRACTICE SESSIONS BETWEEN MALE AND FEMALE VARSITY HIGH SCHOOL GIRLS' BASKETBALL COACHES.

Alan C. Lacy and Phylis D. Goldston, Texas Christian University.

The purpose of this study was to compare the behaviors during pre-season and in-season practice sessions between male and female coaches in girls' basketball at the varsity high school level. Subjects were 10 selected varsity girls' basketball coaches, five male and five female. Each subject was observed six times during the season. Three practices were observed during the month preceding the start of games, the pre-season phase, and three observations were made during the final month of the season, the in-season phase. Data were collected with event recording procedures using the 13 specifically defined categories of the Arizona State University Observation Instrument (ASUOI) as follows: use of first name, pre-instruction, concurrent instruction, post instruction, questioning, physical assistance, positive modeling, negative modeling, hustle, praise, scold, management, uncodable. Observers were trained in the use of the ASUOI, and interobserver agreement checks exceeded the 85% agreement criterion needed to ensure accuracy of the data. Observations were made for thirty minutes in two 15-minute segments during the workout. Data were quantified and percentages were calculated for each behavior category. The most widely used behavior category for the female coaches was post instruction while male subjects employed concurrent instruction the most often. Both genders used the praise behavior approximately twice as much as the scold category. A factor analysis of the 13 behavior categories yielded four meaningful dimensions that were identified as scold, modeling, in-activity, and pre-activity. A two (gender) by two (phase) analysis of variance for each dimension yielded significant main effects for gender in modeling ($d.f.=1,1$; $F=9.485$; $p=.003$) and pre-activity ($d.f.=1,1$, $F=5.413$; $p=.024$). These results indicate that coaching behaviors of the subjects during practice sessions were not significantly different between the pre-season and in-season phases of the season. Though coaching behaviors of the male and female subjects were also similar, the male subjects exhibited significantly more modeling (positive modeling and negative modeling categories) and pre-activity (questioning and pre-instruction categories) than their female counterparts.

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Saturday, April 9
10:45-12:00 noon

THE EFFECTS OF EXPERIENCE ON VISUAL RETENTION AND OBSERVATION STRATEGIES OF SPECIFIC SPORT SKILLS. Jan Lee Drummond, Utah State University.

The purpose of this study was to determine the effect of experience on visual retention of specific sport skills. It was also the purpose of this study to determine preferential trends in observation strategies exhibited among experiential levels. Twenty NCAA Division I softball coaches, 16 NCAA Division I softball athletes, and 20 college-age students with no experience in softball were administered a modified version of the Utah Sport Skill Analysis Test II (USKAT II). Preferential trends in observational strategies of specific sport skills were examined using the USKAT II format. A One-Way ANOVA confirmed a significant ($p < .01$) difference among experiential levels with regard to the visual retention task. Both coaches and athletes performed better than novices on the task. A 3 X 3 ANOVA (Group X Spatial Component) w/repeated measures revealed a significant group effect across spatial components ($p < .01$), and a significant group by spatial component interaction ($p < .02$). A 3 X 3 ANOVA (Group X Temporal Phase) w/repeated measures revealed a significant group effect ($p < .01$) across temporal phases, and a significant group by temporal phase interaction ($p < .004$). Experienced subjects remembered preparatory movements better than novice subjects. Athletes remembered trunk and arm positions more accurately than novices. Coaches remembered the follow-through phase more accurately than novices. It was concluded that; a) kinesthetic and coaching experience does influence visual retention of specific sport skills, and b) preferential trends demonstrated by experienced observers are different than those of non-experienced observers.

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Saturday, April 9
10:45-12:00 noon

A STUDY COMPARING THE TEACHING EFFECTIVENESS OF HIGH SCHOOL BASKETBALL COACHES AND SUCCESS RATE. Dennis M. Docheff, Eastern Washington University.

While much research has been done in the area of teaching effectiveness, little effort has been expended in the analysis of the teaching effectiveness of coaches. The purpose of this study was to analyze the relationships between specific "on court" behaviors of basketball coaches and their athletes, the success rate of athletes measured by records of wins and losses, coaches' knowledge of content, and the evaluation of coaches by athletes and administrators. The behaviors of the basketball coaches and athletes were observed from videotapes of their practice sessions. The Physical Education Teaching Assessment Instrument was used to measure specific behaviors of coaches and athletes. The Coaches Evaluation Instrument was administered to the administrators and athletes of the coaches involved in the study. All coaches in the study completed a basketball knowledge inventory in order to measure their knowledge of content relative to the game of basketball. No restraints or guidelines relative to style of coaching were imposed. The data were analyzed using Pearson product-moment correlations and stepwise regression procedures. It was found that behaviors known to be effective in classroom teaching are contributors of coaching effectiveness. Meaningful negative relationships were found between coaches' total teaching time and time spent in equipment management, organization, beginning and ending practice, other tasks, and coaches' total management. Teams whose athletes spent less time in management tasks during practice experienced higher levels of success in varsity competition than teams whose athletes spent more time in management. Coaches' knowledge of content was found to be positively related to the coaches' total teaching time, athletes' skill learning time, and success rate. Coaches' knowledge of content was negatively related to time spent in organization and total management. Positive relationships were found between the amount of feedback given to athletes by coaches and the evaluation of those coaches by athletes and administrators. There appears to be more to effective coaching than just "X's and O's." If coaching is teaching, there appears to be a need for further research in the area of teaching effectiveness of coaches.

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Saturday, April 9
10:45-12:00 noon

PHYSICAL ACTIVITY PATTERNS OF HIGH SCHOOL STUDENTS DURING A FITNESS UNIT. Karen M. Greenockle, University of Tennessee at Martin; Amelia M. Lee and Jo A. Carter, Louisiana State University.

Belief in the health benefits of physical activity has sparked an interest in the study of fitness levels and activity patterns of American youth. The purpose of this research was to examine the physical activity levels, perceived exertion ratings, and heart rate patterns of high school students during a jogging unit. Subjects were students from 10 intact classes in three large high schools. The 10 teachers volunteered to teach an aerobic fitness unit to one ninth grade class for a period of 8 weeks. The teachers were given an Experimental Teaching Unit which included the benefits of cardiorespiratory fitness, information about target rates, and related factors such as intensity, frequency, and duration of exercise. Students were instructed in monitoring their heart rates. Six students were randomly selected from each class ($\underline{n}$=60) for systematic observation and behavior coding. Coding of four behaviors (jogging in the designated area; walking in the designated area; on-task nonmotor; off-task) occurred in 30s rotational intervals for the activity period. All six students were coded on a randomly selected day, once a week. Each day the class was encouraged to jog and two pulse counts were taken during the hour. The heart rates and a rating of perceived exertion were recorded in a daily log. Means and standard deviations were calculated for all observed variables. Pearson r was used to calculate relationships among the variables. Results indicated that students spent the largest portion (69%) of the time walking. The average time spent jogging was only 18%. Heart rate was coded as being at an appropriate level for gains in fitness (150 + bpm) or inappropriate (<150 bpm) for this age group. The mean percentage of time spent at target rate was 26%, and the mean reported perceived exertion rating equaled 11.1 (fairly light). Correlational analysis indicated that the percentage of time spent jogging was significantly related to perceived exertion (r=.31), and heart rate (r=.39). Heart rate was also related to perceived exertion (r=.53). Results suggest that providing more time in the curriculum for fitness may not result in the intense movement patterns needed for students to improve aerobic fitness. Even though teachers in this study provided basic fitness concepts and encouraged students to exercise at an appropriate level, and consequences of teaching can be understood only as a function of what stimulates the learner to participate. There may be merit in teachers gaining a better understanding of the influence of attitudes on the exercise behavior of adolescents.

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Saturday, April 9
10:45-12:00 noon

COMPARISON OF SUPERVISED GROUP STRETCHING AND INDIVIDUAL STRETCHING IN MIDDLE-AGED ADULTS. Nicolaas P. Pronk, Dennis J. Jacobsen, and Joseph E. Donnelly, Human Performance Lab, Kearney State College, Kearney, NE.

The purpose of this investigation was to compare supervised group stretching (SGS) and individual stretching (IS) conducted as part of an adult fitness program ($\bar{X}$ age = 33.06 yrs). Subjects (SGS N = 25 and IS N = 20) stretched twice per exercise session, 3 d/wk, for 16 wks. Instruction regarding technique was given to both groups and large stretching charts were continuously available to help assure consistency. Subsequent to initial instruction, SGS performed under direction of an exercise leader and IS performed without direction of an exercise leader. Independent t-tests at baseline for sit and reach (S+R), trunk (TR), and shoulder (SH) flexibility showed no significant difference between SGS and IS groups ($p > 0.05$). Independent t-tests at 16 wks showed a significant difference ($p < 0.05$) between SGS and IS groups for S+R with mean increases of 1.75 and 0.94 inches, respectively. SGS showed a 45% greater absolute change than IS from baseline to 16 wks, while SH and TR changes were non-significant ($p > 0.05$). Dependent t-tests for the SGS group between baseline and 16 wks showed relative mean increases of 52%, 15%, and 8% for S+R, SH, and TR, respectively ($p < 0.05$). Dependent t-tests for the IS group between baseline and 16 wks showed relative mean increases of 72%, 14%, and 10% for S+R, SH, and TR, respectively ($p < 0.05$). The results of this study suggest that both SGS and IS are effective methods of stretching in a middle-aged adult population.

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Saturday, April 9
10:45-12:00 noon

A COMPARISON OF MACHINE PITCH AND PLAYER PITCH DELIVERIES ON THE OFFENSIVE AND DEFENSIVE ACTION OF YOUTH LEAGUE BASEBALL GAMES.

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The purpose of this study was to compare the rates of offensive and defensive action in youth league baseball games that used a pitching machine delivery method with those that used the traditional player pitch format. Games were observed for each team from three leagues: a machine pitch league for 7-8-year-olds (12 games), a machine pitch league primarily for 8-9-year-olds (16 games) and a traditional league for 9-10-year-olds (10 games). The leagues' program philosophies and policies were similar and each team practiced approximately the same number of times. Opportunities for offensive and defensive action were recorded using an observational system developed by Martens, Rivkin and Bump (1984) and observations were coded and categorized by four trained observers. Intraobserver agreement exceeded 90% for both offensive and defensive categories both prior to and during data collection. Percentages and rates of activity were calculated for each category of the observational system and descriptive statistics were used to compare action opportunities among the three leagues. Comparison of the offensive categories clearly indicated that players in the two pitching machine leagues experienced far greater offensive activity than players in the traditional league. More specifically, measures for the two pitching machine leagues were two to three times higher than the traditional league for the offensive action categories of partial hits, solid hits, players reaching base via swings, bases advanced and runs scored. Conversely, players from the traditional league were inactive on 66% of all pitches compared with rates of 27% and 34% for the 7-8-year-olds and 8-9-year-olds from the two machine pitch leagues, respectively. The same pattern of results was found for the six defensive categories. Players in the machine pitch leagues attempted and caught fly balls and grounders at rates from two to four times greater than those experienced by players in the traditional league and made and received approximately 40% more throws per minute of action. When the activity rates for each of the nine defensive positions were compared all positions except catcher received substantially more action in the machine pitch leagues than in the traditional league. It was therefore concluded that the adoption of a pitching machine provides 7-10-year-olds with greater opportunities to practice batting and fielding skills compared with the traditional player pitch format.

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Saturday, April 9
10:45-12:00 noon

THE EFFECT OF COMPLETION OF A CONCEPTUALLY BASED COURSE ON SKILL ANALYSIS AND FEEDBACK PROVISION. A. Brian Nielsen and Larry S. Beauchamp, University of Alberta.

The effect of externally provided information on skill acquisition has been well documented (Salmoni & Schmidt, 1984). Therefore, the provision of such information, in the form of corrective feedback is a critical pedagogical task for physical education instructors. In order to accomplish this, an instructor must be able to accurately observe and analyze learners' movements (Imworld & Hoffman, 1983). In fact Armstrong and Hoffman (1979) called for an analytic strategy that could effectively decrease the complexity of the typical motor skill display. The primary purpose of this investigation was to determine the effects of completion of a conceptually based observation and analysis course on the ability to provide corrective feedback concerning 1) a familiar skill, and 2) a novel skill. Prior to taking a university course which focusses on conceptual analysis and observation of movement, subjects (N=48) viewed a videotape of five individuals performing one trial each of a volleyball forearm pass (familiar skill) and a team handball jump shot (unfamiliar skill). Subjects provided "correctional points" after each trial. Upon completion of the course the testing procedure was repeated for the subjects completing the pretest plus a control group (N=22) who had completed the course but had no prior exposure to the videotape. The "correctional points" were classified as corrective accurate specific (CAS), corrective accurate general (CAG), corrective inaccurate (CI), descriptive only (D), reinforcement (R), and other (X). Results confirmed that exposure to the pretest had no significant impact upon post-test results for any of the variables. T-test results indicated that, for the familiar skill, only corrective accurate specific feedback changed significantly ($p < .001$). A similar significant increase ($p < .0001$) was seen for the novel skill. It is therefore evident that the approach of structuring observations around a conceptual basis can yield positive changes in the ability of future instructors to analyze and provide corrective feedback.

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Saturday, April 9
10:45-12:00 noon

THE EFFECTS OF ANTIREFLECTIVE LENSE EYE PROTECTION ON VISUAL PERFORMANCE AND LEARNING A MOTOR SKILL

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Glare may be generally defined as a relatively bright light, or the sensation of a relatively bright light, which produces unpleasantness or discomfort, or which interferes with optimal vision (Brine, 1980). These two classifications of glare are commonly termed discomfort glare and veiling glare. Discomfort glare, while unpleasant or even painful, does not effect the quality of the retinal image, while veiling glare alters and degrades the retinal image but may cause no discomfort. Discomfort glare, while important, is easily avoided by shielding the eyes or simply looking away from the light source. In the present study discomfort glare was indicated by an increase in eye fatigue as a result of squinting and/or other ocular movements designed to combat the present glare. The purpose of this study was to determine whether antireflective lenses were a significant factor in reducing eye fatigue and enhancing physical performance. Forty-six collegiate students (experimental) enrolled in beginning tennis classes wore antireflective lenses throughout the entire class while forty-seven collegiate students (control) enrolled in the same classes did not wear antireflective lenses while learning beginning tennis skills. Eye fatigue was measured on Eye-Trac Camera model 210 which is a state-of-the-art optometric instrument used to measure ocular movement patterns. The effects of antireflective lenses on overall visual performance was determined by using a 2 x 2 x 3 x 6 (GROUP, experimental vs control x OCULAR MOVEMENT x CLASS, early morning classes vs late morning x DURATION, length of ocular movement) analysis of variance. There was a significant difference for each of the main effects, GROUPS - $F(1,45) + 2.09$, $p < .01$, OCULAR MOVEMENT - $F(1,45) = 9.05$, $p < .01$, CLASS - $F(2,45) = 4.41$, $p < .01$, and DURATION $F(5,45) = 2.33$, $p < .01$. A t-test was used to determine the effects of pre/post test tennis skills. The results of a difference, $t(91) = 2.01$, $p. 05$. We conclude that visual performance and physical skills can be enhanced by using antireflective lenses in the presence of glare.

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Saturday, April 9
10:45-12:00 noon

TEACHING REALITIES AND CONTINUED PROFESSIONAL LEARNING: PERCEPTIONS OF FOUR EXPERIENCED ELEMENTARY SCHOOL PHYSICAL EDUCATION SPECIALISTS. Becky W. Pissanos, Bowling Green State University.

The purpose of this interpretive inquiry was to gain insight into the perceptions of experienced elementary school physical education specialists regarding the teaching realities that affect continued professional learning. Participants in this study were four full-time elementary school physical education specialists each with a minimum of five years of teaching experience at the elementary school level and with at least the last two years of experience within the same school or school system. The participants shared their perceptions in a series of three in-depth open-ended interviews. The general interview guide approach was utilized to give focus to the open-ended interviews. All interviews were audio taped and then transcribed for analysis. The constant comparative analytic strategy was employed to analyze the data. The analysis revealed two primary themes in the reflections of the participants. One, the participants did not perceive the elementary school to be a place that fostered or nurtured continued professional learning. Two, the rhythms of the workplace had a tremendous lulling effect on the participants. Sub-themes identified were (a) monotony, (b) isolation, and (c) school/cultural perceptions regarding physical education. Implications for teacher education include assisting preservice teachers to anticipate "real world" problems regarding their ability to grow and learn as professionals in the school and helping them to create strategies to deal with these teaching realities. Implications for organizers of in-school staff development opportunities include the suggestion of reevaluating the types of programs currently offered and giving greater consideration to the needs of school specialists.

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Saturday, April 9
10:45-12:00 noon

ELECTROMYGRAPHIC VARIATIONS DURING A POST-CONTRACTION POSITIONING TASK. Bruce R. Etnyre; Bryan D. Kelley, Rice University

One explanation for kinesthetic aftereffects is that post-contraction sensory discharge effects occur following an isometric or isotonic contraction in which a persistent increase in total sensory discharge results in the perception of movement or distortion of limb proprioception. The purpose of this study was to compare motor output of agonist neuromuscular activity between unbiased limb positioning movement and post-contraction limb movement. A kinesthesiometer measured eight blindfolded subjects' positioning accuracy in the transverse plane. Electromyographic (EMG) recordings of the triceps brachii were collected during movement to the target. The experiment consisted of three phases: a learning phase; a control; phase; and an experimental phase. The learning phase consisted of 50 trials of elbow extension to 30^{o} or 45^{o} with augmented feedback after each trial concerning the amount and direction of error to the nearest $1/2^{o}$. Twenty control trials followed the learning phase and were identical to the learning trials except no feedback was provided to the subject. Experimental trials were performed in the same manner as the control trials except the subject maximally contracted the elbow extensors prior to the target positioning task. EMG data were acquired at 10 KHz during movement for each trial. All movements were executed in less than 75 msec. Separate t-tests were used to compare average Constant Error (CE) of forearm positioning accuracy and average integrated EMG (IEMG) over trials between unbiased and post-contraction conditions. The CE for the control condition (-2.7^{o}) was significantly less than the experimental condition (-4.5^{o}), $t(7) = 8.1$, $p < 0.1$. The mean IEMG value for the experimental condition (153.2 mv's) was less than the control value (180.3 mv's) but the difference was not statistically significant $t(7) = 1.5$, $p > .05$. Although the lower IEMG observed in the agonist may have contributed to the kinesthetic aftereffect which produced the significantly greater undershooting, it was concluded that other factors, such as antagonist activity during the movement, may have also contributed to the effect.

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Saturday, April 9
2:00-3:15 p.m.

NEUROMOTOR PROGRAMMING OF ATHLETES DURING SIMPLE AND COMPLEX MOVEMENT TASKS. Pamela J. Hoyes Beehler, The University of Texas at Arlington, Arlington, TX 76019

The purpose of this study was to examine the relationship between the complexity of a motor task and neuromotor programming (reaction time-RT, movement time-MVT) in athletes performing a rapid movement response using a RT paridigm. Thirteen college-age varsity female softball athletes were tested over a two day period. Each subject was randomly given three movement tasks to perform that varied in complexity based on whether the subject knew in advance that 1) an ipsilateral (IP) visual signal was employed (simple), 2) a contralateral (CON) visual signal was employed (simple), or 3) if the subject did not know in advance that an IP or a CON visual signal was employed (complex). Each subject received 20 visual RT trials/day for the two simple movement tasks, and received 40 visual RT trials/day for the complex movement task. These 80 trials were delivered in four 20 trial blocks with 2 catch trials per block. All subjects used their non-preferred hand ("glove hand") for each movement task. Subjects were seated at a table with the palm of their non-preferred hand resting on a RT response plate (starting position = 0 degrees). The movement response consisted of rapid elbow extension in the sagittal plane moving 60 degrees ipsilaterally a distance of 15 inches to an IP MVT response plate, or moving 60 degrees contralaterally a distance of 15 inches to a CON MVT response plate depending on the movement task condition. Results are shown in the table below:

	Measure (ms)			
Condition	IP RT	IP MVT	CON RT	CON MVT
Simple	236	189	239	222
Complex	250	189	253	220

As anticipated, RT slows as the complexity of the movement task increases, ($p<.01$); however, MVT was unaffected by the complexity of the movement task when subjects moved IP ($p>.05$), and CON ($p>.05$). An unexpected finding was that CON simple MVT and CON complex MVT were both slower than their corresponding same complexity IP MVTs ($p<.01$). It appears that softball athletes: 1) move faster ipsilaterally as opposed to contralaterally regardless of the complexity of the movement task, but 2) initiate movement faster with less complex movement tasks.

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Saturday, April 9
2:00-3:15 p.m.

THE DETERMINATION OF THE ATTENTION SWITCHING TIME IN THE PSYCHOLOGICAL REFRACTORY PERIOD PARADIGM. Harold H. Morris and J. R. Burke. Motor Control Laboratory, Indiana University, Bloomington, IN 47405.

The psychological refractory period (PRP) has been explained by various theories, including the single channel information processing (SCIP) model. Based on the SCIP model, an optimal attention switching time should exist to allow efficient responses to both stimuli. The purpose of the study was to examine the attention switching time by comparing the time required to respond to each of two paired stimuli as function of the duration of the interstimulus interval (ISI). Dual choice reaction times were assessed in ten right hand dominant males. The subjects' task was to either pronate or supinate the one hand in response to a discrete visual stimulus and then, following the ISI, to complete a similiar response with the other hand to a second visual stimulus. With respect to the sequence of stimuli presentation, the subjects were randomly assigned to either a left-then-right or right-then-left groups under the constraint of equal group size. Subjects responded to 24 paired stimuli trials on each of four test days with the ISI's varying among 50, 100, 200, 400, 800, and 1600 msec. Reaction times (RT) were pooled for each stimuli for days three and four and were analyzed using a 2 x 6 (response by ISI) ANOVA model. A significant interaction was found between response (to the first or second stimulus) and ISI ($p < .05$). An analysis of simple main effects of the response revealed that the RT to the first stimulus was faster than the second response to the 50, 100, and 200 msec ISI's, but slower at the 800 msec ISI ($p < .05$). An analysis of the simple main effects of ISI for the second response was significant ($p < .05$) with the RT's at the 1600, 800, and the 400 msec ISI's being faster than the RT's at the 50 and 100 msec ISI's. The slower RT's at the 50, 100, and 200 msec ISI's were expected according to all PRP's theories. The other significant results of this study suggest that the optimal attention switching time occurs between 400 and 1600 msec. Future research in this area should fractionate RT into its motor and premotor components to determine if the changes in RT as a function of ISI is a central mechanism as suggested by the SCIP model. Secondly, in order to more precisely identify the optimal attention switching time, future research should concentrate on the ISI's between 400 and 1600 msec.

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Saturday, April 9
2:00-3:15 p.m.

STIMULUS AND RESPONSE COMPLEXITY IN THE PSYCHOLOGICAL REFRACTORY PERIOD: EFFECTS ON REACTION TIME COMPONENTS. Joy Hendrick, State University of New York College at Cortland; Harold H. Morris, Indiana University, Bloomington.

The psychological refractory period (PRP) is the delay in response to the second of two stimuli paired in sequence with a slight inter-stimulus interval (ISI). Variations in the complexity of the stimulus display as well as the complexity of the response requirements have been shown to independently affect the time required to react to each of the two paired stimuli. While numerous investigations have focused on the psychological refractory paradigm, few have used fractionation procedures to divide each of the reaction times into premotor time (PMT) and motor time (MT), the central and peripheral components, respectively. The purpose of this study was to determine the effects of variation in stimulus complexity and response complexity in the psychological refractory paradigm on total reaction time (RT) as well as PMT and MT. Each of twenty four subjects were randomly assigned to one of four testing groups. Subjects responded to 48 dual and 24 single stimulus RT trials on each of four testing days. Subjects grasped a handle in each hand and responded to light stimuli by rotating one or both of the handles in the direction of the light(s). Subjects in Group A had a one-choice decision for each stimulus while subjects in Groups B and C each had a two-choice first stimulus (S1) and a one-choice second stimulus (S2). Subjects in Group B responded with either supination or pronation of the hand whereas subjects in Group C either responded or did not respond to S1. Subjects in Group D responded with supination or pronation to both S1 and S2. Electromyography was used to fractionate the RTs of each response. A 4 (GROUP) x 2 (TASK) x 6 (ISI) ANOVA with repeated measures on the last two factors was used to analyze RT, PMT and MT for each response. Task variations consisted of responding with same or antagonistic movements. The 6 ISI were 50, 100, 200, 400, 800, and 1600 ms. When comparing Group B with Groups A and D, it was found that increasing the complexity of the stimuli significantly increased the delay in the effected response by increasing the PMT component. There was no significant difference between Groups B and C, thus it is suggested that it is the number of choices rather than the types of choices that affect the delays. While there was no significant difference between the tasks for RT, PMT or MT, all components were significantly affected by the ISI. The RT to S1 to the first stimulus was unaffected by ISI even though its PMT and MT components varied across levels of ISI. Variation in stimulus and response complexity were factors in the length of the PMT only while the duration of the ISI affected the MT component. The results support the conclusion that PMT and MT must be analyzed in addition to RT if the factors that affect the PRP are to be better understood.

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Saturday, April 9
2:00-3:15 p.m.

COINCIDENCE ANTICIPATION PERFORMANCE: COMPETITIVE ATHLETIC EXPERIENCE AND GENDER DIFFERENCES. J. S. Kuhlman, Indiana State University, Terre Haute, IN.

Sociocultural factors have been the explanation most frequently offered for gender difference in coincidence anticipation (CA). The purpose of this study was to assess the relationships of competitive athletic experience, gender and CA performance. Subjects were 119 (59 male, 60 female) college students, aged 17 to 25 years. Subjects were categorized as experienced or inexperienced based upon present and previous competitive athletic experience. Experienced (EX) subjects were current members of intercollegiate teams (basketball, tennis, volleyball), while inexperienced (IE) subjects had never participated in any organized competitive athletics. The Coincidence-Anticipation Accuracy Microcomputer Diskette (Kluka & Zimmerman, 1985) was used to measure CA performance. Absolute error (AE), constant error (CE), and variable error (VE) were calculated for the block of 20 trials. Separate 2X2 ANOVAs were performed for AE, CE, VE; and pairwise comparisons were evaluated by Bonferroni method ($p < .008$). A significant gender main effect was revealed for AE, CE, VE; and a significant experience main effect was found for CE. Pairwise comparisons produced the following: (a) IE males were more consistent, accurate and had less response bias than IE females; (b) EX males were more accurate and had less response bias than IE females; (c) EX females were more accurate than IE females; (d) IE males were more accurate and consistent than EX females; and (e) EX males and EX females did not differ. These results may indicate: (a) that males as a group may biologically possess more CA ability and experience by females as a group may not eliminate the mean difference; (b) that even IE males had more opportunities than EX females to develop their CA ability; and/or (c) the computer task differed from CA tasks in competitive sports, and IE males had more computer experience than the other three groups. Further CA investigations involving computer tasks must include computer experience as a variable, and the tasks must be more ecologically valid.

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Saturday, April 9
2:00-3:15 p.m.

DIFFERENTIAL EFFECT OF VARIATIONS OF RANDOM AND BLOCKED PRACTICE ON NOVICES LEARNING AN OPEN MOTOR SKILL. Sinah L. Goode, Ball State University; Pan Wei, Ball State University.

This experiment investigated the contextual interference effects of different permutations of random and blocked practice. Previous research had indicated that the task demands of an open motor skill tended to negate the otherwise powerful influence of random practice on learning. Further, contextual interference research on learning an open motor skill had suggested that some combination of blocked and then random practice would be the most advantageous for beginners. This view was also held by many practitioners who felt random practice was too difficult for the beginner in early learning. Thirty-six female subjects inexperienced in open motor skills practiced an anticipation timing task with varying stimulus speeds. The subjects were given 72 acquisition trials in one of six groups: random, blocked, random-blocked, blocked-random, random-blocked-random, and blocked-random-blocked. After a 5-minute rest the subjects were tested in a no-knowledge of results (KR) transfer and a new speed transfer phase. Acquisition results revealed a significant block effect indicating improvement for all groups. There was a significant main effect for practice schedule for absolute constant error in no-KR transfer and for absolute constant error and absolute error in new speed transfer. Across both transfer blocks the blocked-random and the blocked-random-blocked groups produced the least amount of error. The transfer results suggested that low contextual interference (blocked practice) followed by high contextual interference (random practice) was important to the facilitation of learning an open motor skill. These findings were discussed from both a theoretical and practical perspective.

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Saturday, April 9
2:00-3:15 p.m.

TIMING AND LOCATION IN THE CONTROL OF SIMPLE ARM MOVEMENTS.
Virginia G. Overdorf, William Paterson College.

The purpose of this investigation was to evaluate the capability of controlling either velocity or duration simultaneously with terminal position in a horizontal arm positioning task. Subjects (n=40) were assigned to two conditions which were determined by the temporal parameter to be controlled conjointly with endpoint. There were three phases in this study. The first phase involved pre-training separately on the relevant temporal parameter and the required target position. In the second, or experimental, phase subjects were instructed to control both the spatial and relevant temporal parameter concurrently. Finally, subjects were tested again on each parameter separately in the third or post-training phase.

The results indicated that terminal position accuracy preempted control of either temporal parameter, but that subjects did attempt to conform to the requirement to control either velocity or duration. However, it appeared that duration control was easier, and more compatible with endpoint control than was velocity control. The only parameter that suffered from the dual-control requirement was velocity, i.e., when subjects were controlling both velocity and endpoint, velocity decreased. Subjects also demonstrated considerable variability in their initial attempts to control velocity. Thus, velocity control was observed to be more difficult than durational control.

The major conclusion drawn from this investigation was that control of simple, discrete arm movements is mediated by terminal position, but there appear to be additional mechanisms underlying the control of arm movements. In particular, the data in this study suggested the existence of a mechanism capable of specifying the intended duration of the arm movement.

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Saturday, April 9
2:00-3:15 p.m.

THE EFFECTIVENESS OF A GLOBAL LEARNING STRATEGY PRACTICED IN DIFFERENT CONTEXTS ON PRIMARY AND TRANSFER SELF-PACED LEARNING TASKS. **Robert N. Singer, University of Florida; Charmaine DeFrancesco, Florida State University; Lynda E. Randall, Florida State University.**

The purpose of this study was to determine the direct effect and transferability of a learning strategy on achievement in self-paced motor tasks. The learning strategy used as an independent variable was the Singer Five-Step Strategy which included techniques to ready, image, focus, execute and evaluate. A second independent variable was the context of the practice situation (a novel laboratory task vs. a real-world sport task). Dependent measures included performance on the initial task as well as performance on a transfer task. It was hypothesized if the strategy learning situation (practice context) was perceived by the learners to be meaningful, task achievement and strategy transfer would be facilitated. Subjects consisted of university students (N = 40) who were randomly stratified according to gender into four treatment groups. The groups included: a strategy group which initially practiced the strategy while learning the laboratory task (SL), a laboratory control group which began the experiment by learning the task without the strategy (CL), a strategy group which initially applied the strategy to the learning of an applied sport task (SA), and a control group which initially learned the sport task without the strategy (CA). The SL and CL groups performed the laboratory task, which required the learning of a series of target movement sequences to a specified signal, while the SA and CA groups attempted to acquire skill in a modified table tennis service task. Following completion of 48 trials with the initial task, all groups performed 50 trials on the transfer task, underhand dart throwing. ANOVAs indicated that both strategy groups performed significantly better than their respective control groups in the initial task. Results on the transfer task indicated that the SA group performed at the same level as the SL group but outperformed both control groups. It was concluded that the Singer Five-Step Learning Strategy facilitates achievement in a self-paced laboratory task and a sport skill that appear to involve moderate to high information processing. However, strategy transfer from one task to another may be influenced by the similarity and the meaningfulness of the learning (practice) situation and the situation requiring transfer.

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Saturday, April 9
2:00-3:15 p.m.

THE POINT OF INTRODUCTION OF A LEARNING STRATEGY AND ITS EFFECT ON ACHIEVEMENT IN A COMPLEX MOTOR TASK. Lynn A. Flora, Robert N. Singer, and Tami L. Abourezk, Florida State University.

The primary purpose of this study was to determine at what point during the learning of a novel complex self-paced task that the introduction of the modified Singer Five-Step Strategy would be most beneficial. Forty undergraduate students were randomly assigned to one of four conditions, after being stratified as to number and sex: (1) the 0% Group received the Strategy before any practice with the task, (2) the 25% Group was provided with the Strategy after 12 trials of practice with the task, (3) the 50% Group was taught the Strategy after 24 trials of practice with the task, and (4) the control group was never administered the Strategy. All subjects performed 48 trials with the task. The apparatus consisted of a 50.80 cm X 50.80 cm board in which 6 circular targets (numbered 1-6), 6.99 cm in diameter, were attached. The distance between the targets ranged from 7.62 cm to 35.56 cm. The movement sequence began with the experimenter verbalizing either "forward" or "backward", indicating the direction of the movement sequence for that trial. Following this command, the multiple light stimulus lit up either the number 1,2,3,4,5, or 6. The illuminated number cued the subject as to the response target to begin with and to touch the targets in a forward or reversed sequence. For example, the subject would respond to a "forward" 3 by touching the targets 3,4,5,6,1, 2. A "backward" 3 would call for a 3,2,1,6,5,4 response. Subjects were instructed that although accuracy was important, speed was the more important factor. Preparation time (PT), movement time (MT), and errors served as dependent measures. A 4X4 (Groups X Trial Blocks) ANOVA indicated that the 0% Group attained an overall MT significantly better than the other three groups, while the 25% Group was faster than the 50% Group and the control. After receiving the Strategy, the 50% Group outperformed the control in trial blocks 3 and 4. Significant differences among the groups in PT indicated a parallel trend between PT and MT: longer PTs seemed to be associated with shorter MTs. From this type of evidence, it seems clear that the learning of the Singer Strategy for application to self-paced tasks involving speed and accuracy is an important consideration for facilitating skill acquisition and performance. Furthermore, introducing the Strategy before any practice, or after minimal practice, with motor tasks possessing a heavy cognitive component seems to lead to the most favorable performance results.

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Saturday, April 9
2:00-3:15 p.m.

MEMORY AND PROCESSING SPEED AS A FUNCTION OF TASK DIFFICULTY: COMMONALITIES BETWEEN CHILDREN AND OLDER ADULTS.

Marsha A. Carnes, Florida State University.

It is well accepted that as adults age, memory is negatively affected (Poon, 1985). Based on the finding that children also have problems with memory tasks (Winther & Thomas, 1981), the primary purpose of this study was to discover whether any similar memory problems emerge for children and older adults when participating in progressively difficult memory tasks. Longer processing is required for difficult tasks, and this may be reflected in slower reaction times for older adults (Salthouse & Somberg, 1982). Therefore, the secondary purpose was to compare any changes in the processing speed of children and older adults as a function of task difficulty. Ten subjects (6 males, 4 females) in each of three groups participated in the study: (1) 8-10 year old Children (C) ($\bar{x}$ age = 9 yrs 3 mos), (2) Young Adults (Y) ($\bar{x}$ age = 22 years), and (3) Older Adults (O) ($\bar{x}$ age = 78). The apparatus consisted of a 12 position selector panel and a multiple light stimulus with 12 separate and numbered light stimuli. The three memory tasks involved remembering a series of numbers on the multiple light stimulus: Task 1 - numbers 1-6, Task 2 - numbers 1-9, and Task 3 - numbers 1-12. The subject viewed a preselected random series containing all of the numbers in the set except for one in particular that was preselected randomly and could be different each trial. Next, the subject held down a microswitch with the index finger of the dominant hand. The numbers (including the previously omitted number) were presented again in a different preselected random order. As soon as the subject saw the number (s)he thought was omitted during the first presentation, a reaction was made as quickly as possible by lifting the finger from the switch. This procedure continued for 10 trials for each of the tasks. Mean errors (E) in response and mean choice reaction time (CRT) for each task were dependent measures. A 3X3 ANOVA (Groups X Tasks) indicated that as a result of task difficulty, CRT increased significantly from Task 1 to 3 by 199 ms for O, 131 ms for C, and 59 ms for Y. It appears that task difficulty did result in slower processing speed, especially for the older adults and children. A second 3X3 ANOVA (Groups X Tasks) indicated that an increase in task difficulty resulted in a significant increase in Es for O and C (both increased by 5.8 Es) but not for Y (increase by 1.3 Es) from Task 1 to 3. Therefore, older adults and children did exhibit similar memory problems which may be a result of ineffective information processing.

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Saturday, April 9
2:00-3:15 p.m.

CONSPICUITY EFFECTS OF THE PROPERTIES OF BORDER & COLOR. Robert Eason & Theresa Smith, U. of New Orleans

Situations exist where response produced feedback is affected by visual figure-ground relationships. Cognitive literature utilizing paper and pencil tasks has established a visual conspicuity theory. Kaufman (1978) concluded that conspicuity is a function of physical differences among stimuli such as diferences in slope, luminance, size, and color. He futher stated that patterns created by borders are important determinants for visual fixation to the stimulus. The purpose of this study was to determine the effects of borders and colors on a gross motor visual figure-ground scoring task. Subjects were 24 college women free from visual deficiencies. The visual displays were three dart target faces similar in size, shape, and color to an archery target and a fourth target idenitical in size and shape but painted white. A visual figure-ground density was established by randomly placing a red, yellow, blue, or green dart within each of 150 discretely marked 3 inch grids on the targets. Four target conditions were created: 1) white targets with randomly colored dart placement, 2) chromatic targets with like colored darts on like colored circles, 3) chromatic targets with contrasting colored darts on the circles, and 4) chromatic target with random colored dart placement. Subjects scored 40 darts thrown by a trained assistant as 5, 4, 3, 2, 1, or 0 respectively. The experimentor removed the dart and recorded the actual score. Thus, the dependent variable was the error score. A completely balanced repeated measures 2 factor ANOVA indicated a significant effect for target conditions only, $F(3,22)=14.23$, $p< .001$. Comparison of means indicated that the conditions with discerable borders yielded superior rating scores. These findings lend support to the importance of conspicuity theory to account for visual perception of stimuli when presented with competing stimuli in figure ground relationships.

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Saturday, April 9
2:00-3:15 p.m.

COMPARISON OF FOUR TYPES OF FEEDBACK ON GOLF PUTTING PERFORMANCE OF NOVICE ADULTS. A.K.Lanphear, L.Y.Overby, J.Whitall, J.E.Clark, & R.W.Tyler. University of Maryland.

Knowledge of results (KR) has been shown to be necessary in guiding the performer to a criterion outcome (Salmoni, Schmidt, & Walter, 1984). However, for some movements (i.e., closed skills), knowledge of performance (KP) may be equally or more important (Del Rey, 1971; Gentile, 1972; Poulton, 1952; Wallace & Hagler, 1979). Previous studies have been confounded by permitting subjects the use of intrinsic KR (e.g., vision) and failing to differentiate between prescriptive and diagnostic KP. It, therefore, was the purpose of this study to address these issues. Instrinsic visual feedback was eliminated by blindfolding subjects. Forty adults (20 males, 20 females) with no previous golf experience performed a golf putting task under one of four conditions: 1)KR (distance); 2)KP diagnostic (force); 3)KP prescriptive (backswing); and 4)KP prescriptive (putterhead speed). Subjects performed 30 acquisition trials with a 15 s intertrial interval. The speed of each putt was measured to the nearest ms. The criterion speed was 300 ms, the speed calculated to "sink" a ten-foot putt on the carpeted surface. Appropriate feedback was given within 5 s of each putt. A two-minute rest was followed by 10 posttest trials given without feedback. A 2(sex) x 4(group) x 8(blocks) ANOVA with repeated measures on the last factor was performed on constant, absolute and variable error scores. The results revealed no group effects for any of the error measures. A significant block by group interaction showed that subjects who received the prescriptive backswing KP were more variable than the other groups during the retention period. This would suggest that this type of feedback was less useful in learning a consistent response. Overall, when intrinsic feedback (i.e., vision) is removed, extrinsic KR and KP appear to improve performance equally. Explanations for this similarity are offered in terms of an associational theory of extrinsic feedback (Schmidt, 1975).

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Saturday, April 9
2:00-3:15 p.m.

THE RELATIONSHIP BETWEEN AGE, GENDER AND PSYCHOMOTOR PERFORMANCE FOR OLDER ADULTS. Robert Weinberg, Lawrence Bruya, Allen Jackson, North Texas State University.

With the increase in the elderly population it is imperative to understand how motoric functioning changes as one gets older. The purpose of the present investigation was to determine the relationship between age and gender and psychomotor performance for older adults. Subjects were 40 males and 67 females with young-old operationally defined as 60 to 71 years old and the old-old being 72 and older. Subjects performed on a variety of motoric tasks including (a) grip strength (dominant and non-dominant) (b) grip endurance (c) rotary pursuit-tracking (d) ring-peg (e) hand steadiness (f) reaction time (g) choice reaction time (h) movement time. Two trials of each task was required to determine the reliability of the measures and results indicated reliabilities ranging from .67 to .98. Performance results were analyzed by two separate 2 x 2 (gender x age) multivariate analyses of variance with post hoc discriminant function analyses and univariate ANOVA's; one for the three grip strength and endurance variables and one for the other motor performance variables. Results for the strength variables revealed a significant gender main effect and post hoc tests indicated that men were significantly stronger than women although there were no gender differences for grip endurance. In addition, results for age revealed that the young-old exhibited significantly greater grip strength than the old-old, whereas the reverse was true for grip endurance. Results for the psychomotor performance variables indicated that females were significantly better than males on the ring-peg and hand steadiness tasks whereas males were better on the rotary pursuit and movement time. Finally, significant age effects revealed that the old-old performed better on choice reaction time although the young-old performed better on balance, hand steadiness and ring-peg tasks. Results are discussed in terms of the practical implications of these differences, along with the existing empirical literature concerning the elderly and psychomotor performance (Kleban, 1982, Osness, 1985, Ostrow, 1983, 1986). Suggestions for future research are offered including the development of intervention programs designed at improving the motoric efficiency of older adults along with taking an interdisciplinary approach to the study of aged populations which combines physiological, psychological and motoric components.

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Saturday, April 9
2:00-3:15 p.m.

Isokinetic Strength of High School Wrestlers Across Age. TJ Housh, GO Johnson, RA Hughes, DJ Housh, RJ Hughes, A Fry, and CJ Cisar. Center for Youth Fitness and Sports Research, University of Nebraska-Lincoln.

The purpose of this study was to compare the absolute and relative (covaried for body weight or fat-free weight) isokinetic forearm and leg strength of high school wrestlers across age. One hundred ninety-five wrestlers (X age $\pm$ SD = 16.36 $\pm$ 1.12 years) volunteered to be measured for flexion and extension strength using a Cybex II dynamometer at 30, 180 and 300°/SEC. In addition, underwater weighing was used to determine body composition characteristics. The subjects were divided into 4 age groups: Group 1 (G1) = $\leq$ 15.00 years (n = 20); Group 2 (G2) = 15.01 - 16.00 years (n = 60); Group 3 (G3) = 16.01 - 17.00 years (n = 52); and Group 4 (G4) = 17.00 years (n = 63). One-way ANOVA or ANCOVA with Tukey post-hoc comparisons were used to analyze the data. Significant ($p < 0.05$) differences across age were found for absolute flexion and extension strength (forearm and leg) at all three speeds of contraction. Post-hoc analyses indicated that in all cases G4 was stronger than G1, G2 and G3. Relative strength (covaried for body weight) differed across age for forearm and leg extension at 30°/sec as well as forearm flexion at 30, 180 and 300°/sec. In all cases G4 was stronger than G1 and G2. Strength covaried for fat-free weight differed across age for leg extension at 30°/sec and forearm flexion at 30 and 180°/sec. For leg extension at 30°/sec G4 was stronger than G2 and G3 while for forearm flexion at 30 and 180°/sec G4 and G3 were stronger than G1 and G2. The results of this study indicated that as the high school wrestlers matured they increased in body weight, fat-free weight, absolute strength and strength relative to body weight and fat-free weight. However, given the group differences in relative values covaried for fat-free weight, the improvements in strength across age cannot be attributed solely to an increase in muscle mass. Furthermore, the age-related increases in fat-free weight make it difficult for high school wrestlers to compete in the same weight classification for consecutive years without losing muscle mass. Therefore it is essential that an accurate evaluation of the body composition of high school wrestlers be performed prior to each season to determine an appropriate minimal wrestling weight.

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Saturday, April 9
2:00-3:15 p.m.

Anaerobic Power and Capacity of High School Wrestlers Across Age. RJ Hughes, RA Hughes, SL McDowell, KB Kenney, TJ Housh and GO Johnson. Center for Youth Fitness and Sports Research, University of Nebraska-Lincoln.

The purpose of this study was to quantify the changes in the anaerobic power (AP) and capacity (AC) of high school wrestlers across age. One hundred and six high school wrestlers (X age ± SD = 16.47 ± 1.03 years) volunteered to be measured using the "Wingate" test to determine AP and AC as well as underwater weighed for body composition characteristics. The subjects were divided into four groups corresponding approximately to the ages of wrestlers from the freshman through senior years of high school: Group 1 (G1) = ≤ 15.50 years (n = 23); Group 2 (G2) = 15.51-16.50 years (n = 29); Group 3 (G3) = 16.51-17.50 years (n = 38); and Group 4 (G4) = > 17.50 years (n = 16). The "Wingate" protocol consisted of a 30-second maximal leg pedaling effort on a Monarch ergometer with resistance set at 0.075 x body weight (BW) in kilograms. Anaerobic power and capacity were defined as the highest work output for a 5-second period and the total work output in 30-seconds respectively. One way ANOVA or ANCOVA (covarying for BW or fat-free weight (FFW)) with Tukey post-hoc comparisons were used to analyze the data. There were no significant ($p > 0.05$) changes across age for height, BW, body density or fat weight however FFW was greater for G4 (X ± SEM = 62.36 ± 1.85 kg) than G1 (53.80 ± 1.91 kg), G2 (55.91 ± 1.56 kg) and G3 (59.29 ± 1.61 kg). For absolute AP, G4 (X ± SEM = 670.59 ± 25.88 watts) was significantly greater than G1 (572.88 ± 23.00 watts), G2 (618.35 ± 22.24 watts) and G3 (653.24 ± 21.75 watts). There were no changes across age for relative AP covaried for BW and FFW or absolute AC. However for relative AC (covaried for BW), G3 (498.72 ± 6.74 watts) was significantly greater than G4 (465.19 ± 10.49 watts). In addition when AC was covaried for FFW, G1 (X ± SEM = 491.71 ± 8.17 watts), G2 (483.92 ± 7.17 watts) and G3 (494.69 ± 6.27 watts) were signifcantly greater than G4 (456.40 ± 9.80 watts). It is likely that a substantial portion of the improvements in absolute AP across age was a function of increases in muscle mass. However further research is necessary to identify the mechanisms responsible for the decrease in AC of G4 covaried for BW and FFW.

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Saturday, April 9
2:00-3:15 p.m.

PHYSIOLOGICAL DETERMINANTS OF RUNNING PERFORMANCE IN PREPUBESCENT AND PUBESCENT MALES. Craig Cisar, Marlys Staley, San Jose State University; Glen Johnson, Andrew Fry, Alan Ryan, University of Nebraska-Lincoln.

The purposes of this study were to (1) identify the physiological determinants of 2-mi running performance in 52 highly active prepubescent and pubescent males aged 8.33 to 14.99 yr and (2) determine if correction of fat-free body density (FFBD) from the adult 1.10 value to the recently published lesser values for younger populations would improve the predictive validity of variables related to running performance. Physiological variables measured via standard laboratory procedures included running economy at 161 m/min (REBW), ventilatory threshold (VT), maximal oxygen uptake (VO2max), anaerobic power and capacity, fatigue index, body weight (BW), relative fat (RF), fat weight (FW), fat-free body weight (FFBW), height, leg length, biacromial and bi-iliac diameters, leg strength, and leg volume. Using the following regression equation developed for estimating a corrected FFBD (FFBD = 1.0652 + .0021(age); r=.99, SEE=.0007 g/cc) resulted in significant ($p<.01$) decreases in RF from 15.8 $\pm$ .8 to 12.1 $\pm$ .9%; $\bar{X} \pm$ SEM) and FW (6.91 $\pm$ .54 to 5.49 $\pm$ .57 kg) and an increase in FFBW (35.90 $\pm$ 1.43 to 37.31 $\pm$ 1.43 kg). Stepwise multiple regression analysis using uncorrected body composition variables identified RF and REBW as the significant variables in the model predicting 2-mi run time (R=.72, SEE=1.40 min) with accounted for variance of 38% by RF and 14% by REBW. Stepwise multiple regression analysis using corrected body composition variables based on adjusted FFBD values identified RF, REBW, VT, BW, and VO2max as the significant variables in the model predicting 2-mi run time (R=.82, SEE=1.20 min) with accounted for variance of 31% by RF, 17% by REBW, 7% by VT, 9% by BW, and 3% by VO2max. In conclusion the use of corrected FFBD values for determination of body composition in prepubescent and pubescent males may result not only in a more accurate assessment of body composition, but also appears to improve the validity of the physiological model predicting running performance.

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Saturday, April 9
2:00-3:15 p.m.

PSYCHOLOGICAL CHARACTERISTICS OF ABLE-BODIED AND DISABLED ATHLETES. Michael A. Horvat, University of Georgia; Glenn Roswal, Jacksonville State University; Donna Jacobs, West Georgia College; Sharon J. Gaunt, University of Georgia.

The purpose of this investigation was to compare psychological profiles of able-bodied and wheelchair athletes at the same competitive event. The results were also utilized to compare athletes by sex and disability. The subjects (N=30) were all 15 wheelchair athletes (10 male, 5 female) and able-bodied athletes (10 male, 5 female) who participated in the Alabama Sports Festival. The subjects were between 15 and 43 years of age with lower limb involvements while the able-bodied competitors were matched randomly by experience, age and event to resemble their disabled counterparts. The athletes were asked to complete a personal data and psychological self-report instrument: The Profile of Mood States (POMS). Based on the results of the data analysis, each group manifested an Iceberg Profile associated with successful competition and had above average moods when compared to non-athletes. Specifically each group demonstrated lower levels of tension, depression, anger, fatigue and confusion while scoring high on vigor or forcefulness needed for successful performance. From the group data analysis no overall significant difference was apparent nor were any gender differences discovered within or between the groups. In conclusion, the findings substantiate the information on psychological profiles for disabled athletes in segregated competitions. An expected finding was the lack of gender differences which were apparent in earlier research. With the positive profile demonstrated by each group of athletes it was concluded that participation in sports competition should be encouraged and may be beneficial in the rehabilitation and adjustment process for the disabled.

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Saturday, April 9
3:45-5:00 p.m.

SELF-EFFICACY AND PSYCHOLOGICAL WELL-BEING OF WHEELCHAIR TENNIS PARTICIPANTS AND WHEELCHAIR NON-TENNIS PARTICIPANTS. C.Michael Greenwood, Hardin-Simmons University; David A. Dzewaltowski, Kansas State University; Ron French, Texas Woman's University.

The purposes of this study were:(a) to determine if wheelchair bound individuals participating in competitive sport were higher on self-efficacy expectations in their sport and in performing daily physical tasks when compared to wheelchair bound individuals not participating in an exercise program or competitive sport; (b) to investigate the psychological well-being of competitive sport participants and nonparticipants; and (c) to examine the relationships between self-efficacy toward sport performance, daily physical functioning, and psychological well-being between groups. Participants in the 1987 Southwest National Wheelchair Tennis Championships (males, n = 77; females, n = 10) and wheelchair bound individuals (males, n = 32; females, n = 8) who had the physical ability but were not active in an exercise program or sport volunteered for this study. Both groups had similar lower limb impairments resulting from spinal cord injuries or amputations (CA = 19-62 yrs.). The subject's self-efficacy expectations toward playing tennis and performing daily wheelchair mobility tasks were assesed. The Profile of Mood States (POMS) was used to indicate psychological well-being. A MANOVA indicated wheelchair tennis participants and nonparticipants were significantly different on strength of self-efficacy toward tennis, general wheelchair mobility and mood states (F (8,118) = 39.53, $p < .001$). Subsequent univariate analyses revealed that wheelchair tennis participants were more confident about performing tennis skills and executing general wheelchair mobility tasks. Wheelchair tennis participants were higher than the POMS norm on vigor and lower than the norm on tension, anger, depression, fatique, and confusion. The nonparticipants were similar to the norm on vigor, tension, depression and confusion but higher than the norm on anger and fatigue. Furthermore, wheelchair tennis self-efficacy and wheelchair mobility self-efficacy correlated significantly (r = .73). Both self-efficacy measures correlated significantly with vigor for the wheelchair tennis participants. Nonparticipant wheelchair mobility self-efficacy correlated significantly with each POMS subscale except depression. It was concluded that wheelchair bound individuals participating in tennis were more confident about performing tennis skills and general wheelchair mobility tasks then wheelchair bound nonparticipants. Consequently, the stronger an individual's efficacy for physical tasks the more positive their perceived psychological well-being.

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Saturday, April 9
3:45-5:00 p.m.

THE INFLUENCE OF SELECTED REINFORCERS ON THE MOTOR PERFORMANCE TIME-ON-TASK OF PROFOUNDLY MENTALLY RETARDED CHILDREN. Lisa M. Silliman, Texas Woman's University; Ron French, Texas Woman's University.

Profoundly mentally retarded (PMR) children possess deficient motor skills that can be improved through physical education instruction. Frequently, an effective instructional program for PMR individuals involves the systematic use of reinforcers. These children tend to have attentional deficits which creates learning problems. The major problem associated with attentional deficits is that children do not attend to the task in order for effective learning to take place. Attending to the task is a prerequisite to respond or spend time-on-task. Reinforcers increase the probability of appropriate attending behavior. The purpose of this study was to compare the Special Olympics soccer accurate kicking performance of 14 PMR individuals (IQ $<$ 25) with the amount of time-on-task spent across baseline and intervention sessions. A single subject AB design with a control group was used. Subjects were randomly placed in a verbal praise (N = 4) or music reinforcement (N = 5) experimental group or in a control group (N = 5) with no reinforcement. Each subject was initially provided 12 practice sessions to allow for learning and adjustment of the skill to occur, then given a minimum of 18 sessions in the baseline phase and a minimum of 30 sessions in the treatment phase. Based on visual analysis, mean scores, and the split-middle technique, the verbal praise experimental group increased their accuracy kicking performance and decreased their time-on-task. The music experimental group increased their accuracy kick at the highest level but demonstrated the need for more time with this task. The control group showed a slight improvement of accurate kicking performance and a slight decrease of time across baseline sessions in comparing these groups. Based on the results of this study the reinforcers positively influenced kicking performance in two different ways. With the subjects in the verbal praise group, time-on-task "decreased" and performance "increased." In contrast, subjects in the music group "increased" their time-on-task and performance "increased." In both instances the major factor in increasing performance could be increased attention to the motor task.

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Saturday, April 9
3:45-5:00 p.m.

THE EFFECTS OF VARYING TYPES OF REINFORCEMENT ON THE FINE-MOTOR SKILL ACQUISITION OF MENTALLY RETARDED ADULTS. **Ron Croce, University of New Hampshire; Stephen Rock, University of Arkansas**

The purpose of this investigation was to compare the effects of four reinforcement conditions--no reinforcement (NR), supplementary knowledge of results in the form of verbal praise and reproof (KR), supplementary knowledge of results plus token economy (TE), and supplementary knowledge of results plus token economy with response cost (RC)--on the fine-motor skill acquisition of 72 mentally retarded adult males. Motor skill acquisition was measured by time-on-target (TOT) on a rotary pursuit apparatus. Training consisted of fifteen 1-min practice trials, separated into three 5-trial reinforcement periods. Data were analyzed by a repeated measures analysis of variance with time (pretest to posttest) as the repeat measures. Based on the results of the analysis, subjects in TE and RC groups achieved significantly higher TOT scores than subjects in KR and NR groups. There was no significant difference between subjects in TE and RC groups. Results of this study were congruent with previous research findings and further support the theoretical rationale that the rate at which retarded subjects acquire fine-motor skills differs under various reinforcement conditions. The fact that differences among reinforcement conditions achieved significance (KR, TE, and RC > NR; TE and RC > KR) indicated a greater relative difference of effectiveness among reinforcement conditions with mentally retarded subjects. Perhaps the most striking general finding of this study was the lack of significant difference between TE and RC groups. The addition of a response cost contingency to a token economy system did not result in significantly greater levels of skill acquisition. Consequently, the potential hazards inherent with the use of response cost, such as developing negative attitudes toward those administering it, can be avoided by removal of such procedures without fear of losing program effectiveness.

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Saturday, April 9
3:45-5:00 p.m.

AN EXAMINATION OF ORTHOPTIC VISION AND BALANCE PERFORMANCE OF NONHANDICAPPED AND LEARNING DISABLED CHILDREN.

Sherry L. Folsom-Meek, Northwest Missouri State University; Debra S. Berkey and Ruth Ann Meyer, Western Michigan University.

Difficulty in maintaining sustained equilibrium and poor postural responses are characteristic of many learning disabled children (Quiros, 1976; Quiros & Schrager, 1979). Recent research, however, indicates that when the depth perception variable is controlled, learning disabled males's static balance performance does not differ significantly from that of nonhandicapped children (Folsom-Meek, 1986). The purpose of this study was to compare orthoptic vision development and balance performance of nonhandicapped and learning disabled children. Subjects who participated in the study were nonhandicapped (n = 10) and learning disabled (n = 10) children between the ages of 10 and 13 years who attended an urban elementary school located in a southwestern Michigan city. The nonhandicapped and learning disabled children were matched by gender and age. In each group, the proportion of male-to-female subjects was 9:1, which is consistent with the gender proportion cited in recent literature (French & Jansma, 1982; Meyen, 1978). Each subject was individually administered the following tests: (a) orthoptic vision tests which included the Cover Test (Pyfer & Johnson, 1981) and an M-125 Biopter test (Stereo Optical, Inc.); (b) dynamic balance test which consisted of traversing a changing consistency board with eyes closed (Quiros & Schrager, 1979) and (c) static balance tests which included the stork stand on the the preferred foot (Sloan, 1956) on the soft area of a changing consistency board with eyes open and closed. Independent samples chi-square analyses of the orthoptic vision tests indicated that one test score of the Cover Test (watch right eye for lateral phoria) was significant [x^2 (18, n = 20) = 13.33, $p < .01$]. A post hoc analysis for chi-square (Schleiffers, 1983) revealed that differences between proportions of groups existed with both rows (no problems and exo/esophoria--greater proportion of nonhandicapped subjects with no problems and learning disabled subjects with lateral phorias). The multivariate analysis of the time-in-balance scores disclosed an overall significant difference between the groups in static balance performance [$F(2,17) = 6.54$, $p < .007$]. The univariate analyses revealed that the nonhandicapped group balanced significantly longer than the learning disabled group in the stork stand eyes open test [$t(18) = 3.72$, $p < .001$]. Results of this study suggest that it is important to examine depth perception when testing static balance performance of children.

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Saturday, April 9
3:45-5:00 p.m.

THE EFFECT OF TWO DIFFERENT COMMUNICATION MODES ON MOTOR PERFORMANCE TEST SCORES OF HEARING IMPAIRED CHILDREN. **John M. Dunn, Oregon State University; Jan Ponticelli, California School for the Deaf, Riverside, California.**

One of the mandates of Public Law 94-142 is to conduct an assessment of the handicapped student's motor domain. Critical to the process of conducting appropriate assessments is the use of valid instruments and test procedures. The availability of appropriate assessment instruments and procedures specific to the various disability populations is disconcerting. The deaf and hard of hearing is a difficult population to assess fairly and accurately. The most significant assessment problems associated with these individuals are language deficits and deprivation which results in impaired communication between the examiner and the child being assessed. While alternate procedures have been employed by both educators and researchers it may be argued that modifying evaluation protocol gives rise to the invalidity of test results (Gerwich and Ysseldyke, 1975; Mercer, 1979; Ysseldyke, 1979; and Bragman, 1982). The purpose of this study was to assess the effect of two different communication modes, Signing Exact English (S.E.E.) and American Sign Language (A.S.L.) on the motor proficiency test performance of deaf students. Twenty-two prelingually deaf students, ages 5-14, from the California School for the Deaf, Riverside participated in the study. Motor performance was assessed by the short form of the Bruininks-Oseretsky Test of Motor Proficiency (Bruininks, 1978). The test was administered twice under different communication modes (A.S.L. and S.E.E.) with the results used as criteria for determining comprehension of test instructions. Subjects were randomly assigned to two groups to negate the order effect of the two test administrations. The tests were administered by a physical educator with certification in both A.S.L. and S.E.E. A paired-t test was conducted to test the null hypothesis that no difference in performance under the two test conditions would be observed. Differences in test scores were observed with the A.S.L. communication mode producing higher test scores. The results of this study provide evidence that the communication mode used in test environments with the deaf population has an effect on the scores obtained. This factor must be considered in making evaluative judgments on these students and their motor performance.

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Saturday, April 9
3:45-5:00 p.m.

THE RELIABILITY AND CONCURRENT VALIDITY OF THE TEST OF MOTOR IMPAIRMENT: Katherine J. Riggen, Indiana University; Dale A. Ulrich, Indiana University.

The purpose of this study was to evaluate the reliability and concurrent validity of the Test of Motor Impairment-Henderson Revision (TOMI-H). This test is designed to detect impairment in motor functioning in children five years of age and older. Items on the test were selected to measure static and dynamic balance, manual dexterity, and ball skills. Point scores on the test can range from 0-16. A higher score indicates less proficiency. A total test score of six has been established to indicate motor impairment. An American standardization program is currently in progress. The sample consisted of 41 children (21 females) in three public pre-schools with a mean age of 5.8 and a standard deviation of .49. The subjects were tested twice on the TOMI-H and once on the short form of the Bruininks Oseretsky Test of Motor Proficiency (BOT-SF). The sequence of testing was randomized. Both tests were administered by trained examiners. Absolute reliability was established by calculating the standard error of measurement (SEM) on the TOMI-H scores from occasion one. A SEM of .86 was obtained. The consistency of pass or fail decisions with the TOMI-H across the two occasions was evaluated by calculating the proportion of agreement index and Kappa. A 90% agreement was obtained and Kappa, the proportion of agreement with chance extracted, was equal to .71. The concurrent validity of the TOMI-H was established by comparing the motor impairment decision with that obtained with the BOT-SF. An 88% decision agreement was obtained. In the five cases of inconsistent agreement, the TOMI-H suggested motor impairment while the BOT-SF did not. In four of these cases, the BOT-SF results indicate that the child was functioning above the 50th percentile. Potential explanations and future research questions will be discussed.

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Saturday, April 9
3:45-5:00 p.m.

VALIDATION OF THE PHYSICAL EDUCATORS' ATTITUDE TOWARD TEACHING HANDICAPPED STUDENTS SURVEY. Terry L. Rizzo, SUNY College at Cortland.

The Physical Educators' Attitude Toward Teaching Handicapped (PEATH) students instrument is a survey that purportedly measures attitudes of physical educators toward teaching students with handicaps in regular classes. The PEATH is derived from Ajzen and Fishbein's model of the Theory of Reasoned Action (1980). The purpose of this study was to validate the PEATH using content and factor analytic validation techniques. The PEATH was subjected to content validation by establishing face validity (determined by six nationally prominent researchers with expertise in educational programs and/or teaching students with handicaps) and sampling validity (achieved by specifying the target, context, and domain of behavior to be measured). The experts were told the purpose of the PEATH and were asked to review it for validity. They commented on the content of the items, suggested improvements in the wording of items, and concluded that the PEATH had sufficient face validity because it adequately sampled the attitudes of physical educators toward teaching students with handicaps in regular physical education classes. The criteria for sampling validity were addressed in the preliminary stages of the development of the PEATH. Data from 194 physical educators teaching in a large, urban, midwestern city were factor analyzed using the principle component factor analysis with both orthogonal (varimax) and oblique solutions after rotation with Kaiser normalization. Items which loaded >0.40 on the same factor in both solutions were viewed psychologically interpretable as contributing to a single factor. The results of the factor analysis showed that there were four factors measured by the PEATH: (1) Effects of mainstreaming on student (with handicaps and students without handicaps) learning; (2) The need for special training to teach students with handicaps; (3) Teacher beliefs about placement of students with handicaps in regular physical education classes; and, (4) The effects of mainstreaming on teachers. The factor analysis also showed that eight of the original 20 items on the PEATH could be eliminated with the result being a more parsimonious (12 item) instrument that measures attitudes of physical educators toward teaching students with handicaps. The other change to the PEATH was in the use of the general labels learning and physically handicapped to the more specific labels mental retardation, behavioral disordered, and learning disabled.

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Saturday, April 9
3:45-5:00 p.m.

ATTITUDES OF PHYSICAL EDUCATORS TOWARD TEACHING STUDENTS LABELED EDUCABLE MENTALLY RETARDED, BEHAVIORAL DISORDERED AND LEARNING DISABLED. Terry L. Rizzo, SUNY College at Cortland; John D. Snell, SUNY College at Cortland; Jennifer L. Courtney, SUNY College at Cortland.

The purpose of this study was to compare the attitudes of physical educators toward teaching students labeled educable mentally retarded (EMR), behavioral disordered (BD) and learning disabled (LD) in their regular classes and identify demographic variables that relate to favorable attitudes. Ninety-four of the 150 (62%) physical educators attending a meeting of the Central District of the New York State Association for Health, Physical Education, Recreation, and Dance completed the revised Physical Educators' Attitude Toward Teaching the Handicapped survey instrument. Reliability (coefficient alpha) of the revised PEATH was computed for all attitude items at .85, and attitude items concerning EMR at .89, BD at .88, and LD at .88. A repeated measure ANOVA demonstrated a statistically significant difference in attitudes of physical educators toward teaching students labeled EMR, BD, LD in their regular classes. A two tailed Tukey post hoc comparison demonstrated significant differences between LD and BD, and LD and EMR. There was no significant difference between the attitudes of physical educators toward teaching students labeled EMR and BD. A forward stepwise multiple regression analysis showed that of ten variables examined, teachers' perceived competence toward teaching students with handicaps was the only variable to significantly relate to favorable attitudes. The results show that physical educators participating in this study had more favorable attitudes toward teaching students labeled LD in their regular classes than students labeled EMR and BD, and teachers who felt competent teaching students with handicaps held more favorable attitudes. It is possible that physical educators held more favorable attitudes toward teaching students labeled LD because teachers perceived LD students to be similar to nonhandicapped students. LD students have average or better intelligence and may be less of a discipline/management concern than students labeled EMR or BD. Teacher competence related to favorable attitudes probably because competence is a function of (at least) knowledge and experience. The more knowledge and experience physical educators have teaching students with handicaps the more responsive they will be in meeting student needs.

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Saturday, April 9
3:45-5:00 p.m.

COACHES OF SPORT FOR INDIVIDUALS WITH DISABILITIES. Karen P. DePauw, Washington State University; Susan J. Gavron, Bowling Green State University.

Even as sport for individuals with disabilities has emerged as a viable entity today, relative little is known about those who coach disabled athletes. In order to examine the demographics of coaches of athletes with disabilities, a 15 item survey was developed and sent to those identified as coaches by the national disabled sport organizations (AAAD, NSACP, NHSRA, NWAA, USAAA, USABA). Of the total of 280 surveys mailed, 160 useable responses (57%) were received. The data were coded, entered, and analyzed utilizing the Statistical Analysis System (SAS) on the University mainframe computer. Included among the findings of the study are: (a) equal numbers of men and women coach (49.4%, 48.1% respectively), (b) few (10%) coaches have a disability, (c) although the range in age of the coaches was 20-60+ years, 63% of the coaches were between 26 and 40 years of age, (d) 84% of coaches held a college degree, nearly half of these with graduate degree, (e) coaches with college degree identified their majors as physical education (33.5%), special education (22.1%), recreation (14.5%), and other such as administration or business, (f) job related, volunteerism, and coach of ablebodied sport were identified as the primary reasons for coaching disabled sport, (g) the majority of respondents participated in sport prior to coaching, (h) individuals often coach for more than one national disabled sport group, (i) coaching responsibilities are found for 5+ winter and 24+ summer sports, (j) at least one third of coaches of disabled sport also coached ablebodied individuals, (k) the most common disabled sports coached were track, field, swimming and basketball, (l) although only 28.1% of coaches held certification in the sport(s) coached, some were certified in more than one sport, (m) the majority (81.3%) of the respondents coached at the national level while 55.6% coached at the international level, (n) over half indicated that they coached more than once a week while 14% coached only during competitions, and (o) although 75+% of the coaches participated in coaching clinics for ablebodied and disabled athletes, additional training in coaching techniques, sports medicine, officiating, and classification was identified as important.

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Saturday, April 9
3:45-5:00 p.m.

RURAL ADAPTED PHYSICAL EDUCATION TEACHER PREPARATION: PRELIMINARY INVESTIGATION. Gloria M. Palma, Washington State University; Karen P. DePauw, Washington State University.

Currently, most institutions of higher learning prepare special education personnel, including adapted physical educators, for employment in urban settings. The need for training of adapted physical education personnel for employment in the rural setting has been recognized but as of yet underemphasized. Thus, the purpose of this study was to investigate the teacher preparation programs in adapted physical education among colleges and universities in the United States. Twenty-four adapted physical educators from colleges and universities from thirteen different states were interviewed during the 1987 AAHPERD Convention in Las Vegas. The interview questions were focused in two areas: the existence of an adapted physical education program, and the inclusion of training in rural adapted physical education. Significant among the findings were (a) 23 of the 24 respondents taught at institutions at which a course in adapted physical education was required, (b) on the average, the required course was a 3-unit undergraduate course in which 12 respondents (52%) indicated that a segment of which was rural-oriented, (c) the amount of time allocated to rural adapted physical education ranged from less than one week (or none) to four weeks, (d) from the total of 24 institutions, only 10 respondents indicated the existence of a major in adapted physical education, and (e) only four (40%) of these ten institutions required practical training in rural districts. Although variations exist in the content, requirements, and enrollment in adapted physical education courses, the conclusion of this preliminary investigation is that the inclusion of training in rural adapted physical education is minimal.

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Saturday, April 9
3:45-5:00 p.m.

A KINEMATIC COMPARISON OF ERGOMETER AND ON-WATER ROWING. Douglas H. Lamb, Dr. William M. Scholl College of Podiatric Medicine.

Thirty subjects from the U.S. Heavyweight Rowing Team selection camp of 1982 were filmed rowing on the water and on an ergometer. The x and y coordinates of the foot, ankle, knee, hip, shoulder, elbow, wrist, hand, and top of head were digitized on one side of the body. The motion of the right and left body segments during rowing was assumed to be symmetrical. The raw data were filtered using a second order Butterworth filter with a 4 Hz cut-off. Displacement and velocity parameters were determined during the cycle from catch to finish during the drive phase. A model of rowing was designed such that the rowing movement could be defined as comprising two closed vector loops. For each frame, a vector loop analysis was done to obtain the kinematic coefficients which were used to derive kinematic variables that were related to the total linear oar velocity. Five kinematic variables which described the contributions of five different body segments to the total linear oar velocity were analyzed statistically to find differences in the patterns of rowing on the water and on an ergometer. The results of a repeated measures ANOVA indicated that the kinematics of the upperarm and forearm segments were sig. different in the two conditions. The upperarm segment contributed sig. more to the total linear oar vel. of on-water rowing early in the cycle than ergometer rowing. The forearm segment contributed sig. more to the total linear oar vel. late in the cycle for ergometer rowing than on-water rowing. The kinematic measures of the upperarm and forearm vel. at the beginning and end of the cycle, however, were relatively small in comparison to the contributions made by the trunk and legs to the total linear oar vel. Therefore, these findings were of minor importance to the overall results of the study. The vector loop analysis provided the major finding that the trunk segment contributed sig. more to the rowing cycle for both on-water and ergometer rowing than any other body segment including the legs. The major contribution of the trunk to the total linear oar vel. occurred at approximately 60% of the cycle for both types of rowing. Because of similarities found between on-water and ergometer rowing, the use of kinematic measures obtained on the ergometer appear to be valid in supplementing physiological measures used in the selection of rowers.

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Saturday, April 9
3:45-5:00 p.m.

KINEMATIC ANALYSIS OF THE FRONT KICK IN KARATE. V. Dianne Ulibarri and Sharon Evans. Michigan State University, East Lansing, Michigan.

During the performance of straight-line karate techniques, the linking joint between the two major body segments involved in the movement tends to hyperextend. The purpose of this study was to examine kinematic parameters of the lower limb during performance of front focused kicks. In this study the action at the knee surrounding the focus or still-point of the foot was examined. Fifteen highly skilled karate performers were filmed using high speed (150 fps) cine techniques. Two LOCAM cameras were positioned mutually perpendicular which allowed sagittal and frontal views to be filmed as each subject performed the kick. Coordinate data of selected sagittal trials were obtained utilizing an overhead VanGuard projection system in conjunction with a sonic pen and IBM PC. Data were smoothed by the second central Taylor method and position data were differentiated to obtain velocity and acceleration data. Baseline data included knee assessments using the anterior/posterior Drawer and Lachman's tests. Evaluations of range of motion were also made and results recorded. This baseline data indicated that results of knee joint laxity tests and range of motion data were within acceptable ranges. An analysis of variance indicated a significant difference between angular displacement obtained via cine data and the extended position for range of motion ($p \leq .05$). In addition, flexion-extension of both knees were tested via a CYBEX. An examination of the CYBEX data indicated there were no significant differences in right-left knee torques for each subject nor did differences exist across subjects.

Angular displacement data indicated that severe hyperextension occurred at the knee followed by a second less severe hyperextension. The velocity of the shank continued in a positive direction until well after the thigh had reversed its direction. This resulted in a ballistic hyperextension at the knee joint caused by the shank's momentum. For all performers, the structure of the knee joint appeared to be primarily responsible for reversal of the shank followed by the stillpoint (focus) of the foot. These findings indicated that severe ballistic hyperextension occurred during the focus portion of the kick. This raises concern regarding injury prevention when teaching and performing focused kicks in karate.

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Saturday, April 9
3:45-5:00 p.m.

MECHANICAL ENERGY IN THE MEN'S FRONT HANDSPRING FRONT SALTO VAULT. Mark D. Ricard, Illinois State University; Joseph Hamill, University of Massachusetts.

The front handspring front salto vault will be the men's compulsory vault in the 1988 Olympic Games. The purpose of this study was to describe the total body and individual segmental contributions to mechanical energy in the men's front handspring front salto vault. Five male gymnasts from the Southern Illinois University men's gymnastics team were filmed with a 16 mm camera operating at 200 fps. Each gymnast performed 5 vaults. All 25 vaults were digitized from initial board contact until landing. Prior to calculating segmental and total body mechanical energy, the raw endpoints were smoothed with a quintic spline. Energy was normalized by dividing by body mass in Kg. Each vault was rated based upon postflight height and distance. Mean postflight hip height was 1.45 m above the horse, with better vaults ranging from 1.52 to 1.83 m. Average distance of postflight was 2.78 m as measured from the end of the horse to the ankle upon landing. In all 25 vaults analyzed the total body mechanical energy (Eb) increased by a mean of 475 J during contact with the vaulting board, and decreased by a mean of 385 J during contact with the horse. In better vaults, the gymnasts developed greater Eb during board contact and minimized loses in Eb during horse contact. The mechanical energy analysis indicated that at board takeoff 53% of the Eb was attributed to the trunk, and the remaining 47% was attributed equally to the leg and arm segments. During preflight Eb was primarily due to the motion of the legs. During postflight energy exchanges occurred between the trunk and the limb segments as the gymnasts completed the somersaulting motion. Total body mechanical energy in all phases of the vault was predominantly due to translational kinetic and potential energy components. Rotational kinetic energy contributed to Eb at board takeoff and during the tuck portion of the afterflight. Rotational kinetic energy at board takeoff was due primarily to the motion of the arms and legs. The results suggested that gymnasts should attempt to maximize the development of mechanical energy during board contact and minimize decrements energy during contact with the horse.

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Saturday, April 9
3:45-5:00 p.m.

THE INFLUENCE OF RUNNING SURFACE PITCH ON LOWER EXTREMITY BIOMECHANICS. Charles W. Armstrong, Panagiotis Spyropoulos, Steven Gullett, Tim Levendusky, Gary Gray, The University of Toledo; Gerald Sutherland, The Toledo Hospital, Toledo, Ohio.

Recent estimates indicate that in excess of sixty percent of all regular joggers experience injury each year. The characteristics of the running surface have been discussed as among those variables influencing the likelihood of injury. In particular, numerous clinicians have associated running on a transverse grade, such as that encountered on streets or banked indoor tracks, with a variety of typically encountered injuries. In spite of retrospective data in support of this, there has been no experimental research to study the involved mechanisms. Thus, the purpose of this project was to examine the influence of transverse grade running on lower extremity kinetics and kinematics. Adult male recreational runners (N = 18) served as subjects. Each completed three testing runs on a treadmill (8:30 min/mile pace), during which the pitch of the running surface was altered to produce transverse grades of zero, three, and six degrees. High speed cinematographic records (200 Hz) of a saggital and a rear view of the subject, as well as vertical ground reaction pressure data acquired through electrodynography (200 Hz), were recorded for each condition. The data were reduced and treated statistically to examine differences between the three conditions in terms of specific temporal, spatial, and pressure variables. The results indicated numerous alterations in gait associated with running on a transverse grade. As the grade increased the uphill foot evidenced increased total rearfoot ROM (61%), maximum pronation (78%), and maximum pronation velocity (47%). In contrast, the downhill foot was characterized by decreases in rearfoot total ROM (61%), maximum pronation (101%), and pronation velocity (19%). Alterations in both the magnitude and sequencing of pressures under the feet (as demonstrated by EDG) were evident, and supported the observed kinematic changes. It may be concluded that transverse grade running alters support phase lower extremity function. Previous authors have discussed the role of such alterations in producing a variety of injuries commonly experienced by runners. Thus, it would appear that individuals who choose to run on transverse grade surfaces may be significantly increasing their risk of injury.

Jointly supported by The Toledo Hospital and The University of Toledo.

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Saturday, April 9
3:45-5:00 p.m.

COMPARISON OF THE VERTICAL JUMP UTILIZED IN THE VOLLEYBALL BLOCK WITH THE STANDING VERTICAL JUMP WITH ARM SWING. Mary Ridgway, University of Texas-Arlington.

Much research has been completed on identifying contributing factors in the vertical jump but little information exists on the process variables related to vertical jumping as performed in the complex skill of blocking in volleyball. The purpose of this study was to identify and measure selected components of the vertical jump as utilized in blocking a spike and in standing vertical jumps with arm swing. Eight well-trained female volleyball players participated in this study. Two filming sessions were required for each subject. In the first session each subject was allowed 5 practice jumps before 3 trial jumps were filmed. All subjects were requested to perform standing vertical jumps for maximum height with prepatory counter movements and to use their arms. In the second filming session each subject was filmed in a competition setting and 5 block jumps were filmed. The right side of each subject was filmed with a 16-mm LOCAM camera at 100 frames per s. Segmental end points were digitized with a Sonic Digitizer from adhesive markers which were placed on the right side of the subject to correspond with shoulder, elbow, wrist, hip, knee, ankle, and 5th metatarsal-phalangeal joint. The coordinates were used to calculate angles and angular as well as linear displacements, velocities, and accelerations. The raw data were smoothed with a second order low pass digital filter set at 6 Hz. A t-test for paired comparisons was used to test for differences between the two types of vertical jumps. The duration of the power phase was significantly ($p<.05$) shorter in the block jump (BJ-.21s) than in the vertical jump (VJ-.39s) although higher jump heights were recorded in the BJ (29.54 cm) than in the VJ (27.69 cm). There was significantly ($p<.05$) less knee flexion and extension in the BJ (ROM-62.05°)than in the VJ (ROM-96.32°) although higher knee angular velocities at takeoff resulted during the BJ (296.39°/s) than in the VJ (258.60°/s). Significantly ($p<.05$) faster angular velocities at takeoff occurred for the BJ in the hips (BJ-312.93°/s; VJ-166.33°/s) and ankles (BJ-316.17°/s; VJ-170.41°/s). Findings included other differences between the two types of jumps with respect to head and trunk positions, shoulder and elbow ranges of motion and angular velocities at takeoff, which have important implications for jump training programs. Coaches should exercise caution in using standing vertical jumps as jump training for blockers.

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Saturday, April 9
3:45-5:00 p.m.

PREDICTABILITY OF BALL VELOCITY IN THE OVERHAND THROW BY UPPER EXTREMITY STRENGTH. Vauhn Wittman, Kathleen M. Knutzen, and Kevin Quinn, Western Washington University.

This study examined the relationship of eight upper extremity strength measures to ball release velocity in the overhand throw. Seven male university students ranging in age from 19 to 33 years of age volunteered as subjects. Ball velocity data were collected in one experimental session. The subjects were filmed with a high speed super-8mm camera from a distance of 12.2 meters at 80 frames per second. All subjects were instructed to throw the ball with maximal effort to a receiver placed approximately 15 meters away. Three film trials were collected. Following film processing, the x and y coordinates of the ball were digitized for two consecutive frames at release. These data were then filtered and resultant ball release velocities were computed. The velocities were then averaged across the three trials. Strength measurements were taken at individual sessions from one to three weeks after the filming sessions. A Cybex Orthotron interfaced to a microcomputer was used with a speed setting of 120 degrees per second. Three trials were collected for the following joint movements of the throwing arm: Elbow flexion and extension, shoulder flexion and extension, shoulder adduction and abduction and shoulder internal and external rotation. The best maximal torque recording for three trials was utilized in the present analysis. The relationship between ball velocity and upper extremity strength measures was analyzed using regression techniques. The results of the multiple regression analysis indicated that four variables provided the best prediction of resultant ball velocity. The regression equation was: Ball velocity = 36.32 + 193.74 (elbow ext.) - 9.5 (shoulder ext.) - 13.9 (shoulder add.) - 80.8 (shoulder int. rot.). The multiple R of .990 was found to be significant ($p < .04$). It was concluded that strength in elbow and arm extensors as well as internal rotators proved to be the most significant predictors of resultant ball velocity in the overhand throw.

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Saturday, April 9
3:45-5:00 p.m.

EFFECTS OF ANTAGONIST PRECONTRACTION AND ELASTIC ELEMENT MEDIATION ON ISOKINETIC TORQUE PRODUCTION. M.D. Grabiner, K.W. Filip, K.R. Campbell, D.L. Hawthorne, The Cleveland Clinic Foundation

The purpose of this study was to investigate the enhancement of isokinetic knee extensor torque output associated with antagonist precontraction. The influences of neural factors and passive elastic elements on the potentiation of skeletal muscle output are important considerations in programs associated with improvement of performance. Male and female subjects performed ten isokinetic knee extension-flexion cycles on a BIODEX dynamometer at six velocities (30, 90, 150, 210, 300 and 450 degrees/s). Two conditions manipulating antagonist (knee flexion) precontraction were studied. In one condition the knee flexion velocity was allowed to occur rapidly and with little resistance (450 degrees/s) whereas in the second condition the knee flexion velocity matched that of the knee extension. Subjects were instructed to produce maximal flexion and extension torques throughout the entire range of motion (approximately 100 degrees) for all trials. Subject knee extension torque data was normalized to the maximum observed value. The results of the analysis demonstrated that precontraction of the antagonist resulted in significant decrements in knee extension torque. The largest decrements were observed in the 30 and 90 degree/s velocities, -26.5 and -19.0 percent of maximum, respectively. Significant differences were observed between male and female subjects. The males demonstrated an inverse parabolic relationship between isokinetic velocity and knee extension torque decrement. That the condition in which knee flexion was rapid and unresisted produced larger extension torques is consistent with the body of literature supporting the storage and recovery of passive elastic energy. The results of this study lead to the recommendation that testing of maximal isokinetic torque be conducted with rapid unresisted antagonist contraction. It is concluded that antagonist precontraction does not enhance agonist output and that rapid unresisted antagonist conditions lend themselves to a more representative evaluation of function.

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Saturday, April 9
3:45-5:00 p.m.

VARIATIONS IN WORK AND DYNAMIC STRENGTH DURING THE MENSTRUAL CYCLE. Ro DiBrezzo, Inza Fort, University of Arkansas.

The purpose of this study was to investigate variations of dynamic strength and endurance of the knee flexors and extensors during three phases of the menstrual cycle. The subjects were 21 females (ages 18-36) who had normal menstrual cycles and were not on oral contraceptives. Each was tested on a Cybex II isokinetic dynamometer at speeds of 60°, 180°, and 240°/sec. Strength was determined by peak torque values of knee flexion and extension at the three speeds. Endurance was determined by a comparison of the first four repetitions versus the last four of 20 repetitions of knee flexion and extension at a speed of 240°/sec. From this, flexion and extension endurance ratios were determined. Each subject was tested within 24 hours from the onset of the menses, at the time of ovulation, and during the luteal phase. The order of the tests at the three speeds was random. Ten subjects were tested over two complete cycles in order to check for reliability. Data were evaluated by analysis of variance. ANOVA indicated no significant differences between values for a particular phase of the cycle and the corresponding phase of the subsequent cycle. There were no significant differences ($p<.05$) among the measured variables during the mensus, ovulation, and luteal phases of the menstrual cycle. The endurance ratios indicated that the knee flexors fatigued less than the extensors. For both flexion and extension, peak torque values ranged from 59.8% to 64.9% of original strength at the end of 20 repetitions at 240°/sec. It was concluded that although the means of the strength variables were not significantly different during the three phases of the menstrual cycle, further study on performance at different cycle stages on women with and without menstrual dysfunction and dysmenorrhea is needed due to the conflicting literature.

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Saturday, April 9
3:45-5:00 p.m.

MEASUREMENT CONSIDERATIONS FOR A MODIFIED TRIALS-TO-CRITERION SERVING TEST FOR VOLLEYBALL. Garry A. Merritt & James G. Disch, Rice University and Carole Schneider, Baylor College of Medicine

The purpose of this study was to examine various measurement considerations of a modified trials-to-criterion (TTC) serving test for volleyball. The specific factors that were examined were 1) the reliability of a 20 serve test and 2) the concurrent validity of selected TTC tests based on the 20 serve test.

The 20 serve test was selected as an appropriate criterion measure because it involved the actual game skill and pilot studies indicated that adequate discrimination could be reached at 20 serves. The order in which the serves were taken was recorded in order to establish TTC for the following successes: 6, 8, 10, 12, 14, 16. Two trials of the 20 serve test were administered on consecutive class days toward the end of the unit.

The intraclass reliability for the 20 serve test was estimated to be .71. The concurrent validity coefficients between the criterion scores and scores on the various TTC measures were found to range between .72 for T6 (six successes) and .90 for T10 (10 successes) of trial one and .88 (T6) and .91 (T10) for trial two.

These results were very encouraging since the mean number of serving attempts necessary to achieve the T10 score for both trials was 12. This indicates that the testing time could be reduced by 40 percent for a sample similar to this.

The results also agreed with previous data collected on a high school aged sample. The reliability of the 20 serve test for this group was found to be .81. The optimum TTC score for the high school sample was T6 with concurrent validity coefficients ranging from .77 to .91.

It was concluded that TTC testing in volleyball was an appropriate method for determining serving competence. For the college sample T10 provided an accurate and efficient means of measurement.

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Sunday, April 10
9:15-10:30 a.m.

THE FACTOR STRUCTURE OF SPEED OF BODY MOVEMENT: A CONFIRMATORY ANALYSIS. James G. Disch, Rice University.

The dimensionality of a number of domains of human performance have been examined by factor analysts. For the most part theoretical models have been established and then examined by exploratory procedures. In the last decade computer programs have become available to allow the researcher to more precisely examine theoretical factor structures through confimatory procedures. This confimatory approach strengthens the a priori nature of the theoretical model and provides a specific factor structure that can be subjected to refutation.

The purpose of this study was to examine a theoretical five factor model of speed of body movement. The original model developed and tested in 1973 contained 6 factors. Exploratory methods suggested that four factors represented the factor space. Two of the original factors clustered together and one hypothesized factor was found to be test specific.

Further examination of the data and review of the literature supported the following factor model: 1) Sprinting Speed, 2) Controlled Speed (i.e., agility), 3) Speed of total body change of direction, 4) Arm Speed, and 5) Leg Speed. Three tests were selected to measure each hypothesized dimension. Multiple trials of all tests were administered to 73 college aged males. Intraclass reliabilities were found to exceed .95 for all tests.

The proposed factor structure was analyzed with the confimatory factor analysis method from the computer program LISREL-VI. For interpretive purposes an orthogonal structure was utilized. Examination of the results indicated that the 5 factor structure was supported. All marker variables loaded above .30 on their respective theoretical dimensions. Only two markers loaded below .50.

It was concluded that the 5 factor structure for speed of body movement is tenable. The speed of total body change of direction factor that was not confirmed under the exploratory approach was firmly identified by the confirmatory procedure.

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Sunday, April 10
9:15-10:30 a.m.

STANDARDIZATION OF TESTING PROCEDURES FOR THE SIT AND REACH FLEXIBILITY FIELD TEST.Heidi A. Orloff, Albion College; Carole J. Zebas, University of Kansas; Judith Burry, University of Kansas.

The problem in this study was one of standardization of the protocol for the sit and reach flexibility field test. The objective behind testing flexibility has been to compare scores against normative values. When flexibility tests are not administered the same way each time the test is given, the subject's score may not be comparable to the normative values already established. The purposes of this study were: 1) to determine the day to day reliability of the sit and reach flexibility field test when specific warm-up protocols were implemented, 2) to determine the number of trials needed to ensure a maximum score was achieved, and 3) to determine the role of anthropometrics in scoring the sit and reach flexibility field test. The subjects for this study were 75 men and women volunteers, ranging in age from 19 to 54 years. The subjects were asked to perform the sit and reach flexibility test until a maximum score occurred. They did this each day until the flexibility measures stabilized. At this point one of three warm-up protocols was implemented. The warm-up protocols included a stretch group, a bicycle group, and a control group. The subjects continued testing for four days past stabilization. Stabilization was detected using intersubject direct replication. Generalizability theory was performed on the maximum score of the sit and reach test for the four days past stabilization for each of the warm-up protocol groups. The number of trials needed to ensure that a maximum score was achieved on the flexibility field test was determined using frequency ratios and an analysis of variance repeated measures design. The statistical analysis of the anthropometric data was computed using Pearson Product Moment Correlation. The .05 level of significance was used for all appropriate statistical procedures. The day to day reliability for the stretch group, bicycle group, and control group was .99, .82, and .80, respectively. It was found that three trials were needed to ensure that a score was achieved that was not significantly different than the maximum score. The waist girth and arm length correlations were significant at -.34 and -.21, respectively. The reach to leg length ratio was not a significant correlation with the sit and reach test at -.19. The conclusions drawn from this study were as follows: 1) day to day reliability was highest with the stretch warm-up protocol, 2) at least three trials are needed to ensure that a subject has achieved a score that is not different from the maximum score, and 3) anthropometric measurements were not highly associated with the sit and reach flexibility test.

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Sunday, April 10
9:15-10:30 a.m.

ACCURACY AND RELIABILITY OF PARTNER-SCORING OF A MODIFIED PUSH-UP TEST BY CHILDREN IN GRADES 3 THROUGH 10. Jack K. Nelson and Seung Ho Yoon, Louisiana State University.

Mass testing in fitness items is administratively advantageous from the standpoint of time. Traditionally, items such as sit-ups, push-ups and distance runs rely on partner-scoring. An obvious drawback to mass testing is the potential measurement error of scoring by the students. This problem is compounded by the acknowledged learning phenomenon in which students tend to do better on a second test administration due to familiarity, release of inhibitions and other factors. It may be assumed that the learning phenomenon is experienced by the scorers as well as the performers. This study examined the accuracy of partner scoring of a modified push-up test given on two occasions. The subjects were 266 boys and girls in grades 3, 6, 8, 9 and 10. The push-ups are performed as follows: from a standing position, the student bends at the hips and, keeping knees straight, places the hands on the floor. Thus an A-shaped position is assumed with hands and feet on the floor and the hips in the air. The partner places a hand on the floor and the performer lowers to touch his/her forehead to the partner's hand, then pushes up to the straight-arm position. The test was explained, demonstrated and practiced. Careful attention was devoted to scoring details. The testing was done during the physical education classes. A second test was given 2 to 3 days later. All testing was videotaped. Thus, subjects were scored on videotape by the researchers to compare these scores to the scores reported by the partners. Intraclass R was used to compute the test-retest reliability of both partner and videotape scoring. Significant discrepancies were found between partner-scored and video-scored push-ups at nearly all grade levels. However, the meaningfulness of the size of the discrepancies was generally negligible. As expected, the magnitude of the discrepancies was greatest with the 3rd graders. The size of the discrepancies improved from the 1st to 2nd test. No apparent differences in scoring accuracy was observed between the sexes. Test-retest R's ranged from .63 to .95. However, significant improvement in performance between the 1st and 2nd tests was found in over half of the comparisons. The results indicated that partner scoring is generally accurate and reliable. However, the need for practice in performing and in scoring fitness test items is strongly reinforced.

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Sunday, April 10
9:15-10:30 a.m.

RELIABILITY OF PHYSICAL FITNESS TESTS ADMINISTERED TO YOUNG CHILDREN. Sarah J. Erbaugh, Wayne State University.

This research examined the test-retest reliability of physical fitness tests for first-, to third-grade children. The 1980 Health-Related Physical Fitness Test (HRPFT) , and Baumgarner's modified pull-up test were included. The reliability estimates from previous studies have been reported elsewhere (AAHPERD, 1980; Baumgartner, 1978). Subjects in nearly all of that research were 5th-, to 12th-grade children; thus, the question about the reliability of physical fitness tests given to young children remains unanswered. Twenty-six children (13 boys; 13 girls) with a mean age of 8.3 years (SD = 1 year) were randomly selected from a larger sample of urban public school subjects, and tested individually on two days, one week apart. Two-way ANOVAs (Design III) were used to estimate the reliability of each item (Safrit, 1976). The R-values for the HRPFT items, 9-minute run, modified sit-ups, sit-and-reach, and skinfold sum, were .83, .83, .93, and .98, respectively. The R-value for the modified pull-up test was .52. Percent of total variance was estimated for between subjects, trials, and error. The reliability coefficients for the HRPFT items were acceptable, and modified sit-ups had the largest estimated percent variance for error (28%). This finding was consistent with previous research, and suggested that various factors may have influenced scores. The modified pull-up test was unreliable as a measurement of arm and shoulder-girdle strength in young children. Uncontrolled factors such as motivation may have contributed to the inconsistency of scores. Baumgartner's test merits further study because the majority of the children in the present research liked the test. All children were able to perform the test. In conclusion, the Health- Related Physical Fitness Test has an acceptable level of reliability when administered to primary-grade children. Additional research is needed to account for factors such as motivation.

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Sunday, April 10
9:15-10:30 a.m.

COMPARISON OF METHODS FOR ESTIMATING RESIDUAL VOLUME FOR HYDROSTATIC WEIGHING. Gary Oden, Georgia College; David Bacharach, Syracuse University.

Assessment of body composition using hydrostatic measures has been considered the "gold standard" for several years. A major concern for accuracy in hydrostatic measures is the determination of lung residual volume (RV). The purpose of this study was to compare three common means of estimating RV. The RV of the subjects (N=60, male, age 19-63) were estimated using the following three methods: age and height equation (A&H) (Goldberg, 1959); 24% vital capacity (24%VC) (Wilmore, 1969); closed-circuit O2-dilution (O2-D) (Wilmore, 1981). Each of the three RV values were then used in the body density and body fat (BF) equations by Brozak (1963). Vital capacity (VC) was first determined on a Collins spirometer as the greatest measured volume that was duplicated after several minutes of rest. A test-retest reliability for the O2-D method was found to be r=.96, SEM=36 ml. The one-way ANOVA for RV estimates ($F(2,57)=3.93$ $p<.05$) was significant. A post hoc with Duncans New Multiple Range Test indicated the O2-D method resulted in a smaller RV than the A&H or 24%VC method. This would suggest that A&H and 24%VC may overestimate RV in males ages 19-63. Interestingly enough, when each of the values of RV were used to determine BF the ANOVA $F(2,57)=1.27$ $p>.05$ failed significance. A mean difference of 2.2% BF represented the variation due to the RV from the three estimates. BF was highest when using the O2-D method and lowest using the A&H method.

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Sunday, April 10
9:15-10:30 a.m.

VALIDITY OF THREE EQUATIONS FOR PREDICTING PERCENT BODY FAT OF ADOLESCENTS AT THREE FATNESS LEVELS

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The purpose of this study was to determine the validity of 3 anthropometric equations derived on normal adolescents. One hundred sixteen males and 86 females ($\bar{X}_{AGE}$=12.8±1.7yrs; $\bar{X}_{HT}$=156.8±11.0cm; $\bar{X}_{WT}$=56.5±19.9kg; $\bar{X}_{\%FAT}$=25.7±11.5%) participated as subjects. The prediction equations were from Lohman (Ex Sport Sci Rev, 1986), Hoerr (Med Sci Sports Ex, 1984) and Johnston (Human Biol, 1982). The equations used combinations of triceps(TR) and subscapular(SC) skinfolds, HT, WT, and age as independent variables. Body density (underwater weighing-UWW) was converted to %fat using equations developed by Lohman (1986). Subjects were divided into 3 fatness categories, based on the sum of TR and SC skinfolds: lean group (LG, TR+SC=<20mm, $\bar{X}_{\%FAT}$=15.5±5.1), average group (AG, TR+SC=20-50mm, $\bar{X}_{\%FAT}$=26.0±6.0) and fat group (FG, TR+SC=>50mm, $\bar{X}_{\%FAT}$=39.2±6.6).

% FAT-UWW vs % FAT-PREDICTED

		CORRELATIONS			SEE		
EQUATION	SEX	LG	AG	FG	LG	AG	FG
Lohman	male	0.39	0.75	0.71	2.14	3.17	7.51
	female	0.42	0.65	0.55	1.40	3.80	6.51
Johnston	male	0.44	0.44	0.26	6.29	6.88	7.96
	female	0.29	0.06	0.20	7.99	6.58	6.31
Hoerr	male			0.73			6.67
	female			0.51			6.60

All mean %fats-predicted were significantly ($p<0.01$) different from mean %fats-UWW, except for Johnston's prediction of FG males and Lohman's prediction for LG and AG females. All correlations (*r*) were low, and standard errors of estimate(SEE) high. SEE, expressed as a percent of mean %fat-UWW, ranged from 7.8 to 44.4%. In summary, none of the equations resulted in consistent estimates of %fat across fatness levels. The high SEE and low *r* indicate these equations result in poor predictions of individual %fat over the range of adolescent fatness.

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Sunday, April 10
9:15-10:30 a.m.

HOW ACCURATELY DO WEIGHT LIFTING MACHINES ESTIMATE THE AMOUNT OF WEIGHT BEING LIFTED? Richard. N. Godsen, College of Charleston, Charleston, SC 29464

Few would deny that weight lifting machines were an important evolution in the area of resistive training. The added safety which these devices bring to this area surely makes them a valuable addition to many training programs. Nevertheless, one has to wonder what is being given up in the name of safety. Is it accuracy? Whereas it is easy to check the poundage being lifted in free weight programs, the values lifted in machine training are usually accepted on faith. Just how accurately do these machines estimate the weight being lifted? This study was designed to answer that question. A sample of nine (9) weight machines was selected from five (5) institutions. These machines varied in age from showroom-new to approximately 16 years. A testing system which consisted of a pulley, a cable, levers, and weights traceable to the Office of Weights and Measures was designed and applied to twenty (20) exercise stations of the machine sample. A total of ninety-one (91) measurements was made by a trained tester. The test-retest reliability of the procedure was quite good (r=.99, SEE =1.9 pounds). In general, the machines gave a reasonably accurate representation of the true weight. The correlation between actual and stated weight for the 91 measurements was .97 with a standard error of 14.0 pounds. The actual and stated means differed by only 0.02 pounds ("t" = -0.01, NS), and just 10% of the comparisons differed by more than 20 pounds. Nevertheless, the considerable standard error suggests that one should be careful about importing or exporting these poundages among different machines. This caveat is corroborated by the fact that the average absolute difference between stated weight and true weight was a substantial 10.7 pounds. Furthermore, one should consider that an error as large as 50 pounds (a 33% over-estimation) is possible. To the extent that these results are representative of the field as a whole, the data suggest that these machines are reasonably accurate in their representation of the amount of weight being lifted. There can be considerable error, however, and care should be taken to develop correction curves if precise training poundages are needed or if the machines are to be used to gather data for research purposes.

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Sunday, April 10
9:15-10:30 a.m.

SELECTION AND CLASSIFICATION OF HIGH SCHOOL VOLLEYBALL PLAYERS FROM PERFORMANCE TESTS. Mary Thissen-Milder, Anamosa High School, Anamosa, IA; J. L. Mayhew, Northeast Missouri State University, Kirksville, MO.

Selection of the best possible players to perform on athletic teams is an important goal for any coach. Traditionally this has been done from subjective observation of playing performance during an initial try-out period. The purposes of this study were to determine the accuracy of general and specific tests for identifying the players on freshmen (FR), junior varsity (JV), and varsity (VR) teams and the precision of tests to differentiate between starters and nonstarters at each level of play. Fifty high school volleyball players were tested during the first week of practice for 6 general and 4 specific motor performance tests. The specific tests included the overhead volley, forearm pass, wall spike, and self bump/set. The general tests included height, weight, %fat, agility run, vertical jump, and 2 flexibility maneuvers. VR players were sign better only in vertical jump and agility than FR and VJ players. VR players were sign better on all specific tests. The combination of forearm bump, overhead set, vertical jump, and weight correctly classified 68% of the players to their correct team. The combination of bump/set, height, weight, and shoulder flexibility allowed correct classification of 78% of the starters and nonstarters. In may be concluded that general and specific tests can greatly aid the selection and classification of high school volleyball players.

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Sunday, April 10
9:15-10:30 a.m.

FACTORS CONTRIBUTING TO THE DEVELOPMENT OF PHYSICAL SELF-ESTIMATION AMONG HIGH SCHOOL ATHLETES.

Peter Y. Lovejoy, Charles B. Corbin, Arizona State University; Shirley Carpenter, Kay Wing, Phoenix General Hospital, Phoenix, AZ.

The purpose of the current analysis was to determine the ability to predict physical self-estimation among a population of male and female high school athletes using their performance scores on a series of physical tests as predictors. Data for 2006 males and 936 females were collected during extensive testing sessions at a regional hospital/sports medicine facility. Physical self-estimation scores were determined through the use of the shortened Physical Self Estimation Scale (Fox & Corbin, 1985). A discriminant analysis was performed using the following variables as predictors: age, height, weight, shuttle run, long jump, pull-ups, 50y dash, and the sit and reach. A skinfold measurement summed from 6 sites was also entered. One function proved significant for males ($p < .001$) with long jump and dash scores, followed closely by weight, contributing most to the profile. The factors of weight, leanness, and long jump were the only major contributors to the significant function for the females ($p < .001$). Using these functions, the analysis was able to correctly classify 78.8% of the males and 70.3% of the females into the high and low self-estimation groups. It appears that age is not a major contributor to physical self-estimation for either males or females. It appears likely that high school athletes develop their perceptions of their physical ability relative to those in their own age group. Whereas overall size was a positive factor for both males and females, leanness (low total skinfold measurement) was important only for females.

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Sunday, April 10
9:15-10:30 a.m.

STUDENT PERCEPTIONS OF TEACHING: INSTRUMENTATION. Thomas E. Deeter, The Iowa State University; Kathryn M. Carlson & Hilary Hay, The University of Iowa.

An instrument was designed to assess student perceptions of teaching in a physical activity setting. The instrument consisted of items derived from other sources of program evaluation, and was posited to contain three factors: teacher evaluation (reflecting satisfaction with the student-teacher interaction), task satisfaction (reflecting affective responses to the course), and course evaluation (reflecting satisfaction with the logistics of the instructional design). 194 students enrolled in the physical education skills program at The University of Iowa completed the eleven-item inventory (with each item rated on a six point Likert scale) at the conclusion of their classes. Although three logical factors were posited to underlie the items, exploratory factor analysis yielded only a single factor, accounting for 61% of the total variance. Confirmatory factor analysis procedures performed on a second sample (n=309) revealed that the single factor solution was a significantly worse fit to the data than the originally posited three-factor solution with correlated factors. Exploratory model fitting was performed on both samples, and on two additional samples (n=314 and n=548). To decrease the probability of errors due to capitalization on chance characteristics of the individual samples, the data were examined to determine the most consistent factor pattern across samples. The resultant three-factor pattern contained 14 item loadings, reflecting complexity in three of the items. This final factor pattern was confirmed with a sample of 158 students, such that the pattern of items adequately represented the relationships found in the data. It was concluded that the current inventory adequately assesses various related aspects of the instructional setting.

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Sunday, April 10
9:15-10:30 a.m.

EFFECTS OF EXERCISE ON INDICES OF BONE INTEGRITY IN POSTMENOPAUSAL WOMEN. Janice Daly, Florida State University.

The purpose of this study was to determine if an eight week exercise program would affect indices of bone integrity in postmenopausal women. Sixteen healthy, Caucasian, postmenopausal women, ages 51-74, participated in this study. All subjects were nonsmokers and had not engaged in regular physical activity for a minimum of three months. Eight subjects were assigned to the experimental group and participated in an eight week, three days per week, supervised exercise program. The remaining eight subjects remained inactive and served as the control group. All subjects maintained a constant self-selected diet which was analyzed for calcium, phosphorus, protein, fiber, and fat. Fitness evaluations based on one mile walk times and exercise heart rates were conducted prior to, and at the conclusion of, the eight week experimental period. Three indices of bone homeostasis, urinary calcium and hydroxyproline, and serum alkaline phosphatase, were used. Serum concentrations of calcium, ionized calcium, phosphorus, and creatinine, and urine concentrations of phosphorus and creatinine were also measured. Results showed the active experimental group had a significant ($p<.01$) improvement in predicted maximal oxygen consumption. The control group had a significant ($p<.05$) reduction in urine calcium and a nonsignificant reduction in urine hydroxyproline. The experimental group had nonsignificant increases in urine calcium and hydroxyproline. No significant changes were found for either group for serum alkaline phosphatase. The control group results (urine calcium decrease from pre to posttesting), when analyzed for other factors, showed a significant ($p<.05$) relationship to subjects taking medication for arthritis. Interference with intestinal calcium absorption from certain medications may have caused these unanticipated results. It was concluded that 1) changes in calcium absorption need to be carefully controlled, 2) eight weeks may be insufficient to produce significant changes in indices of bone formation (serum alkaline phosphatase), 3) the experimental group trends may indicate early changes in bone turnover leading to increases in bone formation.

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Sunday, April 10
9:15-10:30 a.m.

THE EFFECT OF ONE YEAR OF EXERCISE TRAINING UPON THE BONE MINERAL INDEX OF PREMENOPAUSAL FEMALES, AGED 35-50 YEARS. J.B. Holtz, J.E. Ballard, B.C. McKeown, and S.A. Zinkgraf; The Universities of Texas at Arlington and Tyler.

Osteoporosis is defined as decrease in bone mineral content (BMC) until bones fracture without insult. Although these osteoporotic fractures usually occur in the sixth and seventh decade of life, the involutional bone loss preceding a fracture is reported to begin approximately at age 35. The purpose of this study was to evaluate whether participation in an exercise program would decrease bone loss experienced by premenopausal (PM) women, aged 35-50 years. Also, physical work capacity (PWC) was measured to document the training effect of the exercise program. The study was conducted over a 12-month period with bone measurements made every 6 months (pre, 6-months, 12-months). Ss were 8 PM females ($\bar{X}$ Age=41.9$\pm$4.7 yrs) who participated in an exercise program and 19 control Ss ($\bar{X}$ Age=41.7$\pm$3.7 yrs) who were non-exercisers. At each session, the exercise Ss performed a 15 minute warm-up; 30 minute aerobic activity (70% age determined maximal HR) and 15 minute light weight lifting (12-20 reps of 40-60% of 1 RM). During the year of training, Ss participated in 150 exercise sessions (3 days/week for 50 weeks, excluding the weeks of Christmas and New Years). Testing consisted of a Balke TM test and single photon bone measurements (Bone Mineral Content, BMC; and Bone Mineral Index, BMI=BMC/BW) made on the non-dominant arm at the 1/3 and 4 mm distal sites of the radius. Two-way ANOVAs (Groups by Time) revealed: 1) significant ($p \leq .05$) improvement in PWC for the exercise Ss across 12 months of training with improvement (13.8%) occuring primarily during the first 6 months ($\bar{X}$ METS=7.7$\pm$1.5 to 9.9$\pm$1.5), 2) significant decreases ($p \leq .01$) for all Ss in the main effect for time between the pre test and 6-month test at the 1/3 radial site for BMC and BMI ($\bar{X}$ BMC=.872$\pm$.161 to .849$\pm$.056 g/cm and $\bar{X}$ BMI=.748$\pm$.050 to .727$\pm$.056 g/cm^2), and 3) non-significant ($p \geq .05$) group by time interactions since the bone loss was similar between the exercise and control Ss as follows:

Variables	Sites	Gp	n	Pre-Test	6-Month	12-Month
BMI, g/cm2	(1/3 radial)	C	19	.750$\pm$.056	.728$\pm$.062	.740$\pm$.061
BMI, g/cm^2	(1/3 radial)	E	8	.745$\pm$.043	.725$\pm$.043	.740$\pm$.061
BMI, g/cm^2	(4mm radial)	C	19	.432$\pm$.056	.423$\pm$.060	.429$\pm$.058
BMI, g/cm^2	(4mm radial)	E	8	.412$\pm$.025	.404$\pm$.027	.407$\pm$.021

On the basis of these data, it was concluded that one year of exercise training in this study was sufficient to improve PWC but did not prevent bone loss in these PM Ss.

Supported by The University of Texas at Tyler FRC Grant #03

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Sunday, April 10
9:15-10:30 a.m.

THE EFFECT OF TWO EXERCISE MODES UPON BONE MASS, PHYSICAL WORK CAPACITY, AND BODY COMPOSITION IN 41 POSTMENOPAUSAL FEMALES, AGED 50-70 YEARS. J.E. Ballard, S.L. McCoy, B.C. McKeown, and S.A. Zinkgraf; The Universities of Texas at Arlington and Tyler.

Osteoporosis affects one out of three caucasian postmenopausal (PM) females, in the United States. While weight-bearing exercise (WBE) has been reported to slow the involutional bone loss associated with menopause, the effect of non-weight-bearing exercise (NWBE) has not been thoroughly investigated. The purpose of this study was to compare the bone status of PM women who performed WBE (i.e. walking, playing tennis, or aerobic dancing) with those who performed NWBE (swimming) in order to assess the efficacy of those modes of exercise for PM women. Age matched non-exercisers (NEs) served as control Ss. Physical work capacity (PWC) and body composition (BC) parameters also were assessed in order to quantify the effect of these two exercise modes. Forty-one PM Ss who had never received hormone replacement therapy comprised 3 study groups: 1) NWBE (n=7, $\bar{X}$ Age=58.4±3.7 yrs); 2) WBE (n=17, $\bar{X}$ Age=55.4±5.3 yrs); and 3) NE (n=17, $\bar{X}$ Age=57.9±5.3 yrs). Each S completed a Balke TM test, single photon bone test at the 1/3 and 4 mm distal sites of the radius, and a hydrostatic weighing test. One-way ANOVAs and Neuman-Keuls Post Hoc Analyses revealed: 1) that BMC (g/cm) was significantly ($p \leq .01$) higher at the 1/3 radial site for WBE Ss over NE Ss (.809±.098 to .693±.108) with NWBE Ss (.741±108) in between WBE and NE Ss but not significantly different than either. The trend of these revealed that the WBE Ss had higher $\bar{X}$ values than the NWBE or NE Ss for all bone measurements, but there were no other significant differences in bone parameters between the groups; and 2) that the NWBE and WBE Ss had significantly ($p \leq .05$*) higher PWC (METS) and leaner BC variables than the NE Ss but were not significantly different from each other. These $\bar{X}$s were as follows:

GRPS	METS	BODY WT (kg)	BODY DENSITY (g/cc)	% FAT (%)	FAT WT (kg)	FAT F WT (kg)
NWBE	8.52±1.2	57.3± 6.2	1.033±.011	28.4±4.9	16.4±4.1	40.9±3.8
WBE	8.47±1.5	59.4± 8.1	1.031±.016	29.2±6.9	17.6±5.9	41.7±4.6
NE	5.68±2.3*	63.4±11.1	1.015±.008*	36.2±3.5*	23.1±6.4*	40.2±6.7

On the basis of these data, it was concluded that Ss who performed WBE had a higher BMC at the 1/3 distal radial site than Ss who performed NE. However, there was no difference in the effect of these two exercise modes upon PWC and BC. Therefore, these data suggest that both WBE and NWBE appear appropriate for PM women but WBE may be adviseable for women predisposed to osteoporosis.
Supported by The University of Texas at Tyler FRC Grant #86

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Sunday, April 10
9:15-10:30 a.m.

Generalized Equations for Body Density Estimation from Skinfold Measurements of 35-72 Year Old Women. Barry C. McKeown, Shirley A. Bryars, Joyce E. Ballard, Stephen A. Zinkgraf, The Universities of Texas at Arlington and at Tyler.

It has been previously demonstrated that generalized equations can be utilized for estimating body density from measures of skinfolds in 18-55 year old women who differ in age and body composition (Jackson et. al., 1980). The sample of subjects analyzed by Jackson et. al. included 17 females between the ages of 50-55 years. They subsequently concluded that caution needs to be employed when utilizing these equations to estimate fatness in older females. Therefore, it was the purpose of this study to estimate body density (BD) from measures of skinfolds (SF) in 35-72 year old women (N=117). Included in this sample are 60 females between the ages of 55 and 72 who were older than the oldest subject in the study by Jackson et al. BD was measured by hydrostatic weighing with residual volume measured by the nitrogen wash-out technique. A Harpendon caliper was used to measure seven SF with a Gulick tape for measuring circumferences (C). Mean values for the subjects were as follows: age = 53.8 $\pm$ 9.6 yrs; ht = 164.3 $\pm$ 5.9 cm; wt = 62.8 $\pm$ 10.5 kg; BD = 1.0237 $\pm$ .0155 gm/cc; BF = 32.2 $\pm$ 6.3%; FW = 20.6 $\pm$ 6.8 KG and FFW = 42.2 $\pm$ 5.6 KG. Generalized equations were then developed for estimation of BD by the backward elimination technique and compared with those of Jackson et. al. The quadratic form of the sum of three and seven SF in combination with age and gluteal C produced multiple correlations that ranged from 0.782 to 0.851 with standard errors of .0084 to .0099 gm/cc for body density and 3.8 to 4.1% for body fat. When a comparison of these multiple correlations were made with those of the original equations, it was noted that they were lower (R = .842 to .852) with higher standard errors (SE of .0083 to .0086 gm/cc and 3.8 to 3.9% BF) than those of Jackson et. al. These equations were subsequently cross-validated on a sample of 39 women. The correlations on the cross-validated equations between predicted and hydrostatically determined % BF ranged from 0.747 to 0.847 which are lower than those of Jackson et al (R = 0.815 to 0.820) on their cross-validated equation. When body fatness was predicted on these subjects from the original generalized equations of Jackson et. al. the % BF was underestimated between 3.7 and 4.2% for the composite group. Additionally, there was a progressive systematic increase in the % BF underestimation from 1.5 to 7.3% when an analysis by age group was made from the younger to older. Therefore, when estimating body fatness from the generalized equations on women beyond the 55 year old sample of Jackson et. al., it appears that a systemically lower % BF underestimation outside of the standard error exists. Thus, it is recommended that data from 55-72 women be included in the generalized equations for body composition evaluation of that age group. Furthermore, it is concluded that caution still needs to be taken when estimating body composition of women over the age of 40 years.

Supported by AAUW Educational Foundation Grant

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Sunday, April 10
9:15-10:30 a.m.

CROSS-VALIDATION OF GENERALIZED SKINFOLD EQUATIONS FOR PREDICTING BODY DENSITY OF 35-72 YEAR OLD WOMEN. S.A. Bryars, J.E. Ballard, B.C. McKeown and S.A. Zinkgraf. The University of Texas at Tyler.

Prior research which estimates body density (BD) from measures of skinfolds (SF) has shown body composition equations to be age/sex specific. Jackson et al (1980) have reported generalized equations for predicting BD from SF measures on women between ages 18 and 55 years. However, they advised caution when using these equations for women over age 40. This caution seems to be a legitimate concern due to the absence of females over age 55 with only 17 females between ages 50 and 55 years measured in their research. Therefore, it was the purpose of this study to cross-validate the generalized equations with a second sample of subjects (N=117) which included females both in and over the original 18-55 year age range including 60 women between ages 55 and 72 years. BD was determined by hydrostatic weighing with residual volume measured by the nitrogen wash-out technique with the subjects in the seated position. A Harpendon SF caliper was used to measure 7 SFs and a Gulick cloth tape for measuring the gluteal circumference (C). Mean values for the composite group were as follows: Age=53.8±9.6 yrs; Ht=164.3±5.9 cm; Wt=64.8±10.5 kg; BD+1.014±.014 g/cc; %F=32.2±6.3; FW=20.6±6.8 kg and FFW=42.2 ±5.6 kg. The quadratic form of the sum of three, four and seven SF in combination with age and C produced multiple correlations (R) that ranged from .757 to .798 with standard errors (SE) of 3.8 to 4.1%F. As was expected, these R's are lower than those of Jackson et al (R=.842 to .867) while the SE's are higher (3.6-3.8%F) due to the inclusion of the 55-72 year old Ss. When these data (N=117) were utilized in all 18 of the Jackson et al equations, the %F values were predicted to be 27.2-28.6% which is 3.6-5.0% less than the 32.2% estimated by hydrostatic weighing. Usually, the estimated %F values are outside of the ±3.6-3.8% SE reported for the original equations. When the data are analyzed by 10 year age groups, the following results are found to underestimate %F for the equations with seven SF, SF^2, age and C as follows: 35-44 yrs (n=21) by 1.5%; 45-54 yrs (n=36) by 3.0%; 55-64 yrs (n=42) by 4.3%; 65-72 yrs (n=18) by 6.3%. Thus, the underestimated differences become progressively greater with age. A similar comparison with the four and three SF equations reveals the expected underestimated %F values for each age group. In conclusion, it appears the general equation concept is acceptable but because of the progressively greater underestimation of %F in the older females, a regression analysis with additional data including women over age 55 should be considered.

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Sunday, April 10
9:15-10:30 a.m.

The Validity of Anthropometric Estimations of Body Composition in High School Wrestlers Across a Season. RA Hughes, TJ Housh and GO Johnson. Center for Youth Fitness and Sports Research, University of Nebraska-Lincoln.

The purpose of this study was to determine the validity of 23 anthropometric equations for estimating the body composition of high school wrestlers across a season. Thirty-three high school wrestlers (preseason X age $\pm$ SD = 16.7 $\pm$ 1.1 years and postseason = 16.9 $\pm$ 1.1 years) volunteered as subjects for the study. Twenty-three anthropometric measures including eight skinfolds, nine circumferences and six diameter were obtained from each subject both preseason and postseason. The mean body density (BD) values (X $\pm$ SD) determined from underwater weighing were 1.0785 $\pm$ 0.0085 and 1.0844 $\pm$ 0.0074 $g \cdot ml^{-1}$ respectively. Preseason cross-validation analyses indicated that the linear equations of Katch and McArdle (1973) and Mayhew et al. (1981) as well as the quadratic equations of Lohman (1981), Thorland et al. (1984) and Jackson and Pollock (1978) resulted in the most accurate estimations of BD. Total error (TE), constant error (CE), standard error of estimate (SEE) and r for these equations ranged from 0.0077 to 0.0083 $g \cdot ml^{-1}$ -0.0024 to 0.0030 $g \cdot ml^{-1}$, 0.0073 to 0.0077 $g \cdot ml^{-1}$ and 0.43 to 0.54 respectively. Postseason cross-validation analyses indicated that the linear equation of Sloan (1967) as well as the quadratic equations of Jackson and Pollock (1978), Pollock et al. (1976) and Thorland et al. (1984) resulted in the most accurate estimations of BD. TE, CE, SEE and r ranged from 0.0063 to 0.0077 $g \cdot ml^{-1}$, -0.0008 to 0.0011 $g \cdot ml^{-1}$, 0.0064 to 0.0070 $g \cdot ml^{-1}$ and 0.37 to 0.51 respectively. The quadratic equation of Thorland et al. [BD = 1.1136 - 0.00154 (sum of triceps, scapular and midaxillary skinfolds) + 0.00000516 (sum of triceps, scapular and midaxillary skinfolds)^2; Human Biology, 56:439-448, 1984.] was found to be the most accurate predictor of changes in the the body composition of high school wrestlers across a season.

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Sunday, April 10
9:15-10:30 a.m.

Changes in the Body Composition, Muscular Strength, and Anaerobic Characteristics of High School Wrestlers Across a Season. SM Bauge, JM Schilke, RJ Hughes, RA Hughes, DJ Housh, TJ Housh and GO Johnson. Center for Youth Fitness and Sports Research, University of Nebraska-Lincoln.

The purpose of this study was to determine the changes in body composition, muscular strength, and anaerobic characteristics of high school wrestlers across a season. Thirty-five wrestlers ($\bar{X}$ age $\pm$ SD = 16.6 $\pm$ 1.8 yrs) volunteered to be measured for body composition via underwater weighing, as well as isokinetic leg and forearm flexion and extension strength at 30°, 180°, and 300°/sec using a Cybex II dynamometer. In addition anaerobic power (AP = highest 5 sec output) and capacity (AC = total 30 sec output) were obtained using the "Wingate" Anaerobic Test. Related t-tests indicated that for body composition, significant differences ($p < 0.05$) were found for body weight ($\bar{X} \pm$ SEM, preseason = 62.88 $\pm$ 1.85 kg; postseason = 61.7 $\pm$ 1.75 kg), body density (preseason = 1.076 $\pm$ 0.002 kg·l^{-1}; postseason = 1.082 $\pm$ 0.001 kg·l^{-1}), relative fat (preseason = 10.39 $\pm$ 0.70%; postseason = 7.88 $\pm$ 0.52%), fat-free weight (preseason = 56.18 $\pm$ 1.68 kg; postseason = 57.03 $\pm$ 1.63 kg), and fat weight (preseason = 6.51 $\pm$ 0.45 kg; postseason = 4.92 $\pm$ 0.35 kg). There were no significant differences across season in absolute or relative muscular strength except for absolute forearm extension at 180°/sec ($\bar{X} \pm$ SEM, preseason = 38.75 $\pm$ 1.85 Nm; postseason = 41.47 $\pm$ 2.10 Nm) and arm extension at 180°/sec relative to body weight (preseason = 0.59 $\pm$ 0.02 Nm·kg^{-1}; postseason = 0.63 $\pm$ 0.02 Nm·kg^{-1}). There were no significant differences ($p \geq 0.05$) across season for AP or AC per unit of body weight ($\bar{X} \pm$ SEM, AP/body weight preseason = 9.31 $\pm$ 0.15 watts·kg^{-1}, postseason = 9.31 $\pm$ 0.18 watts·kg^{-1}; AC/body weight preseason = 7.58 $\pm$ 0.11 watts·kg^{-1}, postseason = 7.60 $\pm$ 0.11 watts·kg^{-1}). However there were significant ($p < 0.05$) decreases across season for AP and AC relative to fat-free weight ($\bar{X} \pm$ SEM, AP/fat-free weight preseason = 10.39 $\pm$ 0.15 watts·kg^{-1}, AP postseason = 10.07 $\pm$ 0.18 watts·kg^{-1}; AC/fat-free weight preseason = 8.46 $\pm$ 0.12 watts·kg^{-1}, postseason = 8.22 $\pm$ 0.12 watts·kg^{-1}). In general the results of this study indicated that while body weight, relative fat and fat weight decreased and fat-free weight increased across the season, there were no substantial changes in strength or anaerobic characteristics relative to body weight. Although the weight loss allowed the wrestler to compete in a lower weight classification, there were few functional advantages in terms of strength or anaerobic capabilities.

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Sunday, April 10
9:15-10:30 a.m.

DIFFERENCES OF THE FAT-FREE BODY IN RELATION TO HEIGHT BETWEEN OBESE, AVERAGE AND LEAN CHILDREN. M.H. Slaughter, C.B. Christ, R.A. Boileau, University of Illinois, Urbana-Champaign and T.G. Lohman, University of Arizona.

The purpose of this study was to determine the differences of fat-free body (FFB) per unit of height between lean, average, and obese children, aged 8 to 18 years. Six groups were formed based on percentiles developed by Ross et al. (1985), from the sums of the triceps and subscapular skinfolds. They were: lean males (n=35), average males (n=42), obese males (n=28), lean females (n=22), average females (n=29), and obese females (n=20). Percent fat was estimated using a multicomponent equation of body density, body water and bone mineral. FFB was calculated by subtracting fat weight from total weight. Regression lines best predicting FFB from height were as follows:

lean males	$Y = .0000097(ht^3) + 2.72$; SEE = 4.75
average males	$Y = .0000115(ht^3) - 3.32$; SEE = 5.37
obese males	$Y = .0000122(ht^3) - 3.36$; SEE = 6.42
lean females	$Y = .0000064(ht^3) +12.65$; SEE = 3.23
average females	$Y = .0000100(ht^3) + .08$; SEE = 3.45
obese females	$Y = .0000092(ht^3) + 5.10$; SEE = 3.24

Within the males, between group analysis revealed significant differences in the slopes of the lean and obese lines. Both groups were similar at a height which typified prepubescence; however, the obese group increased in FFB more markedly than did the lean males, causing a divergence of the groups with increased height. The average group fell between the other two groups as no significant differences were observed between it and the lean and obese groups. Similar results were found among the female groups, the only difference being that the average group differed significantly from the lean group in both the absolute amount of FFB per unit of height cubed, and in the rate of change in FFB with increased height. These results indicate differences exist in the FFB per unit of height relationship among lean, average and obese children, and that the group differences vary according to sex.

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Sunday, April 10
9:15-10:30 a.m.

BODY COMPOSITION OF DOMINANT AND MODIFIED SOMATOTYPES. William W. Bolonchuk, University of North Dakota; Clinton B. Hall, USDA-ARS Grand Forks Human Nutrition Research Center; Henry C. Lukaski, USDA-ARS Grand Forks Human Nutrition Research Center; William A. Siders, USDA-ARS Grand Forks Human Nutrition Research Center.

Somatotype dominance is identified by the component with the highest rating. Modification of this component may result from either of the non-dominant components. Thus a dominant mesomorph, 251, is a significantly different physique than a 451 because of the modification of the endomorpohic rating. This increase in the endomorphic component obscures the mesomorphic dominance by increasing the endomorphic modification. The body composition of dominant somatotypes or modification of the dominant somatotype was determined to ascertain whether the difference in dominance or the modification of the dominance was associated with a different component of body composition. A total of 445 adults, 199 females and 246 males participated in the study. Body composition was determined by hydrodensitometry according to Akers & Buskirk (1969) and somatotypes were determined by the Heath and Carter (1967) anthropometric method. A computer sort identified three groups according to dominant somatotype. Another fifteen groups were identified by modified somatotype for males and for females. ANOVA and Scheffe contrasts indicated significant differences in fat weight for the dominant somatotypes: endomorphs 21.8 and 23.0 kg, mesomorphs 15.6 and 14.3 kg, and ectomorphs 11.2 and 8.7 kg for females and males, respectively. Fat free weight for females was significant, $p < 0.05$, between female ectomorphs and endomorphs, 45.5 and 48.3 kg, but not for mesomorphs, 45.5 kg. Fat free weight was significant, $p < 0.05$, between male ectomorphs and mesomorphs, 62.6 and 71.1 kg, but not endomorphs, 67.3 kg. None of the comparisons between modified somatotypes was significant for fat free weight among the females. Fat free weight was significant, $p < 0.05$, for male ectomesomorphy versus mesoendomorphy and mesoectomorphy respectively. Six of the 15 modified somatotype comparisons for fat weight were significant for the males and 8 for the females. Although the trends of the fat weight and fat free weight clearly indicate trends for the dominant somatotypes, these trends do not necessarily continue for the modified somatotype.

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Sunday, April 10
9:15-10:30 a.m.

A Test of Electromotive Theory Applied to Body Composition Estimation.

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The application of electromotive theory to body composition analysis implies two assumptions: 1) body fat is dielectric, and 2) no individual differences for non-fat tissue specific resistivity (ρ). Assumption 1 (**A1**) implies a zero correlation between the length squared (L^2) divided by resistance (**RES**) of the whole body and body fat volume (V_{fat}). Assumption 2 (**A2**) implies that between subject variance (S^2) for ρ will be zero. It was the purpose of this study to test **A1** and **A2**. Fifty-two male (M) and 47 female (F) subjects with a mean ($\pm$ SD) age of M = 23 $\pm$ 5yrs, F = 24 $\pm$ 5yrs and fat % of M = 14.3 $\pm$ 5.4, F = 25.1 $\pm$ 8.3 were studied. Body volume was measured by hydrostatic weighing (at residual lung volume). Body fat mass was computed from body density using the Siri equation and converted to volume by assuming a fat density of 0.99 gm/cc. Non-fat tissue volume (V_{nft}) was calculated as the difference between body volume and V_{fat}. Whole body **RES** was measured with a Valhalla Scientific Bio-resistance meter. Length was measured as the distance from the wrist to the ankle. ρ for each individual was calculated by the following equation:

$$\rho = V_{nft} * RES / L^2$$

The correlation between L^2/RES and V_{fat} for males was $r = 0.06$ ($p > 0.05$) and $r = 0.30$ ($p < 0.05$) for Females. When V_{nft} was held constant, these correlations became $r = 0.26$ ($p > 0.05$) and $r = 0.04$ ($p > 0.05$). These data support the validity of **A1**. The S^2 of ρ for males was 1576.1 Ω^2-cm^2 and 8500.8 Ω^2-cm^2 for females. The male and female S^2 for ρ were significantly greater than zero ($\chi^2, p < 0.05$). These data demonstrate that **A2** is not valid. It is concluded that electromotive theory cannot be universally applied to a two component model of body composition.

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